THE AEROPLANE and ASTRONAUTICS

SEPTEMBER 28, 1961

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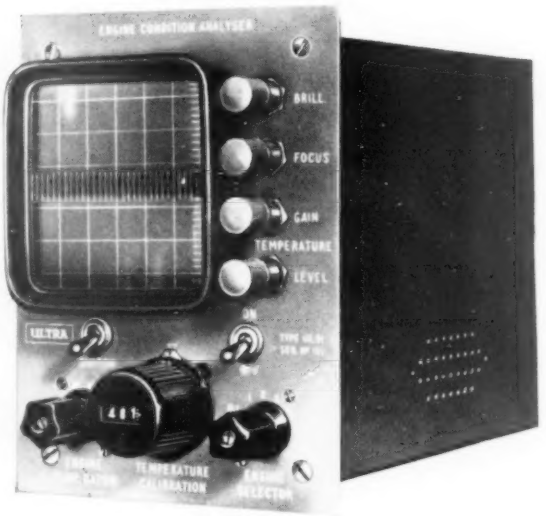

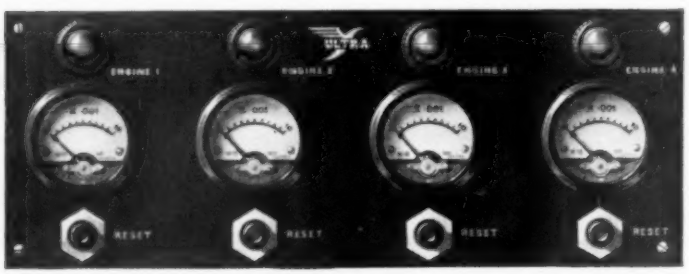

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THE AEROPLANE and ASTRONAUTICS

VOLUME 101 NUMBER 2606 SEPTEMBER 28, 1961

The Problem of Pilferage

Cash, diamonds, gold bars and gold dust valued together at nearly a quarter of a million pounds—could anything read more like something out of a pirate adventure story? In fact, such treasure is still being conveyed about the World in the normal way of commerce.

In this instance our reference is from reports of the recent case at the Central Criminal Court when a loader employed by B.O.A.C. admitted to a theft from mail bags while loading them into aircraft. He was one of 10 men who faced charges arising out of "wholesale thefts at the Airport which had been going on for many months."

In all sentences were passed on nine men.

For years the amount of passengers and freight being moved by international air transport systems has been steadily growing. Recently, much attention has been focused on the increasing proportion of air freight carried.

Among the arguments which have been advanced in favour of the transport of freight by air have been the reduced risk of damage arising from less transhipment together with the reduced possibility of losses by pilferage. This is the justification for drawing attention to the case in view of its air transport implications. The figures mentioned are an indication of how large is the part played by airlines today in moving treasure from one place to another.

Also during the week under review, a television programme was devoted to the work of British immigration officials. This film, which seems to have aroused general interest and created a favourable impression, emphasized the need to screen entrants to this country so that where necessary undesirable visitors may be excluded.

However, the lowering of Customs barriers which is bound to come may one day make today's delays from Customs and Immigration procedures only of historic interest. The possibility of pilferage, on the other hand, must be expected to remain and no airline can afford to overlook this.

Decreasing the Hazard

A great many people on this side of the Atlantic will rejoice in the award, recorded on another page, of this year's Daniel Guggenheim Medal to the energetic director of America's Flight Safety Foundation, who is known the World over to be dedicated to the cause of aviation safety. It is of more than passing significance that an annual award of this calibre, which is made for notable achievements in the advancement of aeronautics generally, should acknowledge the paramount importance of work undertaken to reduce the hazards of flying.

Regrettably enough, accidents will always happen and where they are spectacularly calamitous—as is so often the case with aviation accidents—they will always receive their full measure of publicity. In such a context it is not always easy for ordinary folk to see such unhappy events in their proper perspective: sometimes it is even difficult for the better informed to avoid becoming over-pessimistic. For this reason it has become our custom to publish, each quarter, a note of civil air accidents for the preceding three months. Those for the third quarter of 1961 will be discussed in our next issue.

Meantime, despite an apparent sudden increase in the number of air accidents during the past week or so, it is important not to overlook the steadily decreasing accident *rate* in civil aviation. Nor should one forget that it is to the untiring efforts of people like the recipient of the 1961 Daniel Guggenheim Medal that this is so.

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Matters of Moment

Jerome Lederer Honoured

RECIPIENT of the 1961 Daniel Guggenheim Medal has been announced as Jerome Lederer, director of the Flight Safety Foundation and the Cornell-Guggenheim Aviation Safety Center in New York. Known the World over as an authority on aviation safety, Mr. Lederer will receive the award at the end of November at a ceremony organized by the American Society of Mechanical Engineers.

Sponsored by the A.S.M.E., the Society of Automotive Engineers and the Institute of the Aerospace Sciences, the Daniel Guggenheim Medal is awarded annually for notable achievements in the advancement of aeronautics. In Mr. Lederer's case it has been given "for lifelong dedication to the cause of flight safety and his constant and untiring efforts to reduce the hazards of aviation."

His close association with aviation began in 1926 when he became aeronautical engineer for the U.S. Air Mail Service which started in that year. For 10 years he was chief engineer in charge of loss prevention for Aero Insurance Underwriters Co., and in 1940 became the first Director of the Safety Bureau of the U.S. Civil Aeronautics Board. He was appointed director of training of the U.S. airlines' War Training Institute at the outbreak of World War II.

Glider Aerobatics at Dunstable

NOT till 13.30 hrs. did cloud base lift high enough for the National Glider Aerobatic Contest to begin on Sept. 24 at Dunstable. Even then, launching height had to be restricted to 1,600 ft. above ground, allowing only 1,100 ft. of aerobatics for those who observed the 500-ft. lower limit, and little more for those who didn't.

Into the latter category came the most spectacular flight of all by Douglas Bridson, last year's winner. He carried on his final stalled turns till he had just enough space for a down-wind beat-up past the judges, a turn into wind, and a landing 10 ft. beyond the spot-landing target.

Having set this release height for the first competitors, the judges, who were the Lockheed International Aerobatic Trophy Panel with "Bill" Bedford as gliding adviser, could not change it as cloud base continued to rise; however, this did not incommode those who would only have continued the same manœuvres as before if they had been allowed more height. Even so, many were able to fit in a "four-leaf clover," though Flt. Lt. "Lefty" Kurylowicz had to forgo his particular brand of it, which involves a 270° turn after each of the four loops.

Derek Piggott, C.F.I. at Lasham, had an Olympia 403 with which he was able to include some upside-down glides beginning and ending with either half rolls or half loops. He managed to include many more manœuvres than most of the others, and his polished performance deservedly won him the first prize and the Jack Hanks Trophy.

After receiving these from Air Chief Marshal Sir Theodore McEvoy, president of the R.A.F. Gliding and Soaring Association, Derek Piggott went up again and performed all the manœuvres he would have done if launches to 2,500 ft. had been allowed in the contest. These included a long, slow upside-down glide all round the flying field.

Flt. Lt. B. B. Sharman, of the R.A.F. Wessex Club, won second prize in a Swallow whose owner, Godfrey Harwood, allowed three other competitors besides himself to fly it. He had fitted a smoke-producing apparatus under the tail, but its pretty pink smoke had a life-span of only 1½ manœuvres. "Bebe" Sharman had been the 1959 winner.

With the same machine Dan Smith of the London Club, who had been winner of the first contest in 1957, secured third prize. Flt. Lt. Kurylowicz was placed fourth and George Scarborough fifth. Every pilot, as he landed, became a competitor in a spot-landing competition. Sharman won it with 3 ft. 11 in. from the target; Scarborough ran him close with 4 ft., and Flt. Lt. A. S. Loveland, of R.A.F. Windrushers Club, was 6 ft. away.—A.E.S.

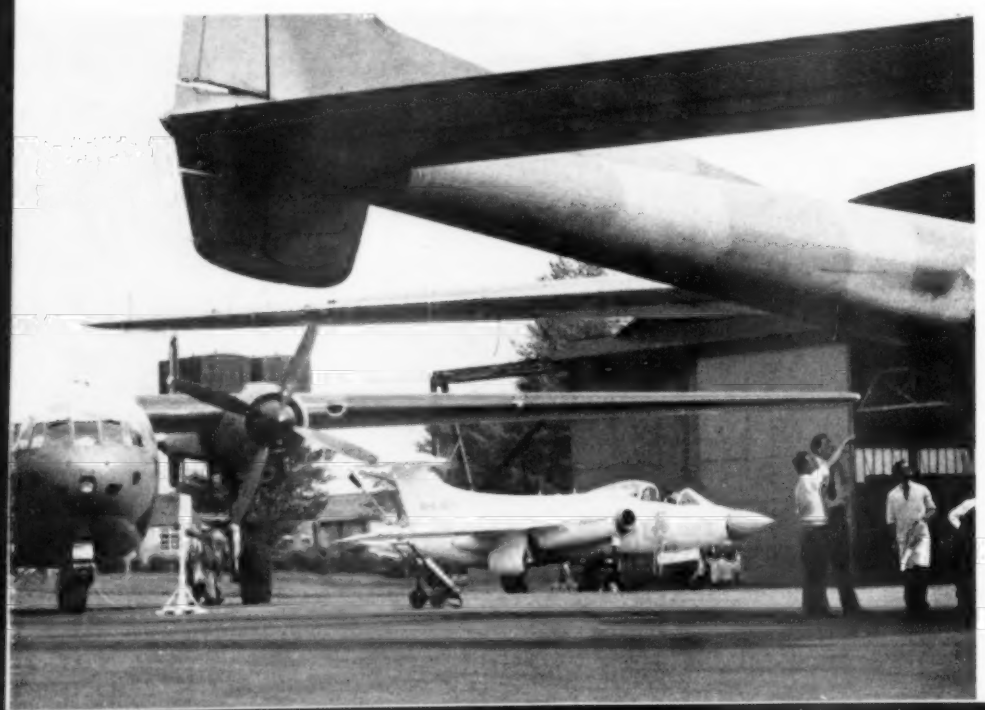
Sweden Chooses the Falcon

HUGHES FALCON air-to-air missiles, in radar and infra-red guided versions are to be built in Sweden as principle armament for the newest version of the Saab Draken, the J35F. An extensive test programme has been conducted on the Falcon by Saab, L. M. Ericsson (makers of the reconnaissance and sight radar) and Bofors (who will be concerned with licence-production of the missile). Two test J35s have flown with Falcons, which are carried one under each wing and two under the fuselage.

The two versions of the missile to be built in Sweden are identified by Hughes as the HM-55 with radar homing and HM-58 with infra-red homing. They are designated Rb 327 and Rb 328 respectively by the Royal Swedish Air Force.

The J35F is the latest announced version of the Saab Draken, and with its Rolls-Royce Avon 300-series engines (with Swedish afterburner), Ericsson radar, Saab S7 collision course sight, Saab FH5 autopilot and Falcon weapons, must be counted as one of the three most potent air defence fighters in production in Western Europe. Ordered in greater quantity than earlier Draken versions, it is operated in conjunction with the Swedish STRIL 60 ground control organization.

For the record, the earlier Draken variants are as follows: J35A—first production version with Avon 200 series (RM6B), equipping two Wings of Flygvapnet, and able to carry four Rb 324 Sidewinders in addition to two 30-mm. cannon and 12 13.5-cm. attack rockets. J35B—following the A in production, with improved radar and gun sight. Sk 35C—two-seat training version with longer front fuselage. J35D—developed B, with Avon 300 series (RM6C), higher critical Mach number and Saab FH5 autopilot. S35E—reconnaissance versions of the J35D with cameras for high- and low-altitude operation.



GERMAN INTEREST.—Last week-end a Blackburn Buccaneer was put through its paces at Furstenfeldbruck near Munich at an air display held on the fifth anniversary of the re-formation of the Luftwaffe. Two German Air Force Noratlas freighters carried the Buccaneer's ground personnel and equipment from Home-on-Spalding Moor to Germany.

The Hammarskjoeld Tragedy

DESPITE a natural tendency to think in terms of possible sabotage, all the events leading up to the fatal crash of the DC-6B carrying the Secretary-General of the United Nations appear to point to an entirely accidental cause.

When looking at the facts as these have been reported it seems likely that a difficult exercise in long-distance night-flying had ended in failure.

The first point is that a direct-track distance of 960 naut. miles was being flown almost if not entirely by dead reckoning methods. In fact, the distance covered was very much greater, since the DC-6B flew on a roundabout route to avoid Katanga. It seems unlikely that any ground navigation aids would be available until Ndola could be contacted or its NDB picked up.

From the reports it seems that there was a 1 hr. 50 min. difference between the original (10.20 hrs.) E.T.A. and the later (12.20 hrs.) E.T.A. Whether this difference was due to a revised take-off time, to changes in chosen route, or to navigation difficulties, remains to be seen.

The report from the survivor (who has since died)—to the effect that Mr. Hammarskjoeld had gone up to the flight deck to suggest a revision of plans or a change in destination—does not make much sense. It is far more likely that the Secretary-General was invited to the flight deck to be told that things were not going too well and that a landing (forced or otherwise) might have to be made.

The further statement about "explosions" before the crash could well be related to the poppings and bangings of engine(s) which were sucking the last pints of fuel from emptying tanks.

Against this supposition is the fact that the aircraft appeared to have burned after the crash—which suggests that a reasonable amount of fuel remained in the tanks. The "explosions," in that case, might simply have been the result of closing the throttles or of running out of the fuel from the tanks which had been selected.

The DC-6B's crew of six included a pilot-navigator—but even so the crew would have been hard-worked on this difficult flight.

Ndola's 6,650-ft. runway (which is 4,160 ft. a.m.s.l.), has threshold and runway lighting, but no approach lighting. Navigation aids of use to the DC-6B consist of VDF and an NDB to the east of, and in line with, the runway.

At the Guildhall Gallery

ONCE again the Society of Aviation Artists is exhibiting a selection of paintings at Guildhall in the City of London.

It is an unpalatable fact to many that the name of the society is now in small type below the general heading of "The Industrial Painters' Group" with whom it was recently incorporated. It may be that many a would-be visitor has not bothered to look beyond the word "incorporating" and this would account for the drop in attendance. A pity, for the exhibition shows a fair proportion of aviation subjects.

Apart from three uncompromisingly abstract paintings by Harold Dent, this year impressionism is out. Most of the pictures are of accurately drawn aircraft—either flying over some well-known landmark or in a recognizable situation. It seems that, unlike the artist who imaginatively distorts and declares "That's how *I* see it," the aviation painter always sees the object of his devotion with the most exact and inexorable precision and feels that he is unfaithful if his brush strays in the smallest degree from fact to fancy. See him wince if he detects such a lapse in a fellow artist's offering.

This exhibition shows the professionals on their pinnacle and the amateurs improving all the time.

Two of the most difficult effects to put across on canvas, movement and sound, are always excellently done by G. Davison Coulson (remember his deafening "Blast-Off"?). This year he whisks sand into our eyes on a windy airstrip at Iwo Jima (102).

Those who seek particularly the David Shepherd paintings will find his Army Air Corps Skeeter hovering over a khaki-coloured landscape, its tail apparently well clear of the frame, so cleverly has he used the effect of light to give a third dimension (30).

I liked Geoffrey Draper's little water colour of the flagged approach to the exhibition tent at Farnborough, gay with sunshine (94); also the ice-cold water beneath the Catalina in John Palmer's "Watcher of the North" (49).

Of the two pictures shown by Harry Cooper, one (75) will appeal to anyone nostalgic about Brooklands. And C. W. E. Waller has a nice composition in his "Thunder and Lightning" (4). Visitors will unfortunately look in vain for a Frank Wootton, a Keith Shackleton or a Pamela Drew.

The Exhibition will remain open from 10 a.m. to 5 p.m. except Sundays, until Oct. 7.

On behalf of those who hesitate before abandoning a lunch-hour, could not some gallery be found, preferably in the West End, where the doors could stay open until, say, 8 p.m.—even on Sundays?—H.M.L.

TRANSITIONAL HOVER. — The Hawker P.1127 VTOL strike aircraft hovers at Dunsfold on the thrust produced by its Bristol Siddeley Pegasus lift-thrust powerplant. As reported last week the P.1127 has now successfully made a number of transitional flights.

Matters of Moment . . . .

Eurospace Established

AT a meeting in Paris on Sept. 21, the industrial association of "Eurospace" was formally established by the approval of statutes and the election of a council. Full details of the European study group were given in our article, "Aerospace in Europe," on Sept. 14. Brought into being on the initiative of Hawker Siddeley in this country and S.E.R.E.B. in France, the organization is being supported by many leading companies in Europe interested in aerospace development.

Leading officials of Eurospace, elected in Paris last week, are: M. Jean Delorme (president); Mr. M. N. Golovine (vice-president), and M. Vinsonneau (secretary-general). M. Delorme is president of Air Liquide; Mr. Golovine is managing director of Hawker Siddeley's A.T.S. Company, and M. Vinsonneau is deputy general manager of S.E.R.E.B. Headquarters are at 8 rue Cognacq-Jay, Paris 7e.

Hugh Raymond Vaughan-Fowler

WING COMMANDER H. R. VAUGHAN-FOWLER, who died in London on Sept. 25, aged 62, was a remarkable man. The R.N.A.S. taught him to fly in 1917 and he stayed in aviation for the rest of his full life, totalling some 5,000 flying hours on more than 200 types. He flew the first "airlines" with Handley Page Air Transport and was a test pilot at Martlesham Heath for three years. He got his first taste of the Orient with the 1921 Sempill Mission to Japan and later founded the Far East Aviation Co. and the Hong Kong Flying Club.

It was by his association with Indian aviation, however, that he was best known. This began in 1934 when he flew a B.A. Eagle on a demonstration tour of India and stayed there to start the Indian Aviation Development Co. He served through the second War with the R.A.F. in India as Senior Aerodrome Inspection Officer. Then he started the monthly *Indian Skyways*, which later became *Asian and Indian Skyways*.

His searing editorials, pages long, fearlessly exposed the shortcomings of organizations and individuals in Indian aviation. I came to regard him as the C. G. Grey of the Asian aeronautical Press—sincere and dedicated to his cause: the development of all aspects of flying in Asia and especially in India. He was a colossal one-man crusade, pouring out a torrent of opinion and advice in a variety of publications, producing his magazines, including the *Aviation Directory of Asia*, and visiting and travelling. He was on his way back to Bombay from an Air-India inaugural flight to New York, via Prague, when he died. A "one-off" character, his like will not be seen again in Indian aviation.—WREN.

The Coronado Problem

EXCESSIVE drag is apparently the reason for the failure, to date, of the Convair 990 Coronado to meet its speed and range guarantees. On present performance, the 990 is said to be unable to fly non-stop across the U.S. with a full payload, and the problem is believed to be so serious that cancellation of the entire project is being considered. The key parties are General Dynamics (of which Convair San Diego is an operating division) and American Airlines, which originally sponsored the 990 and has 25 on order.

To discover the cause of the drag problem, General Dynamics has taken the unusual course of asking the Cornell University to conduct wind-tunnel tests. These are expected to be complete by the middle of October, and it will then be possible to assess the cost of any modification programme necessary to recover the lost performance. American Airlines could, no doubt, insist, under the terms of its contract, that General Dynamics work on the aircraft until it meets the guarantees; but G.D. might prefer to cancel the entire programme (and write-off the costs for tax purposes) rather than endure continuing losses. In these circumstances, American Airlines—which needs the aeroplanes to complete its Astrojet re-equipment programme—may be prepared to accept the 990s without further modification, perhaps with a penalty payment from G.D. Mr. Arthur E. Raymond, until recently chief engineer of Douglas commercial transports, has been retained by American Airlines to make an assessment of Convair 990 potential.

Other customers for the 990 are Swissair (five), S.A.S. (four) and Real Aerovias/Varig (three). A further complication is that the Hughes Tool Co. has ordered 13 of these aircraft, which it had intended to sell or lease to T.W.A.; since Howard Hughes no longer has control of that airline, however, the future of these aircraft is obscure (see our issue for Aug. 24).

The Convair 990 (originally the Convair 600) differs from the Convair 880 in having a longer fuselage, greater wing chord and area, more fuel, turbofan engines and four anti-shock bodies on the wing trailing edge. Its published performance characteristics (which are not necessarily those in the specification guarantees) include a maximum cruising speed of 556 knots (624 m.p.h.) at 21,500 ft. and a no-reserves range with maximum payload of 4,340 naut. miles at 450 knots at 35,000 ft.

The first flight was made on Jan. 24, 1961, and excessive vibration of the outer engine pylons was encountered. This has been overcome by shortening and therefore stiffening the pylons, but this and other modifications have already caused a six-month delay in deliveries. Flight trials were resumed on Apr. 20, when it was claimed that the VNE speed of Mach 0.91 was reached. A cable to Convair from THE AEROPLANE AND ASTRONAUTICS last week elicited the fact that five Coronados are now in flight status and five more factory complete, but brought "no comment" on the status of the flight and wind-tunnel test programme.

General Dynamics has to date written-off (before taxes) a total of some $337 million in respect of its commercial jet programmes. This includes $167 million written off in 1960—when a net loss of $27 million was recorded—and $116.5 million written off in the first half of 1961, when a net loss of $39.5 million was reported.

WHEEL-SKIS FOR CARIBOU.—De Havilland Canada have developed a hydraulically operated wheel-ski gear for the Caribou. The skis can be raised or lowered, relative to the main wheels, on the ground or in flight. Conversion takes 2½ hours, and no jacks or special equipment are needed.

Late News

Passing through Rome during last week, Ambassador Spinelli, Under Secretary of U.N.O., said that the Organization would open an immediate Board of Inquiry into the DC-6B disaster in which Mr. Dag Hammarskjoeld lost his life. ICAO would provide two technical members of the Board.

On the same day a commission of inquiry appointed by the Directorate of Civil Aviation in Sweden, consisting of Nylen, Landin and Lindman, passed through Rome en route for Ndola.

* * *

General Aldo Remondino was appointed Chief of Staff of the Italian Air Force at the beginning of September, succeeding General Silvio Napoli, who resigned because of ill health. General Remondino has served in the Italian Air Force since 1926. All his squadron service has been as a fighter pilot. He was well known as a formation aerobatic leader in the immediate pre-War period. He is 53 and is still an active, qualified jet pilot. His last appointment was Military Adviser to the President of the Republic.

(Other news items will be found on pp. 420 and 436A.)

Composite Powerplant versus Lift/Thrust Engine

WITH the demonstrations of transitional flight made last week by the Hawker P.1127, and the excellent public performance of the Short SC.1 at the past two S.B.A.C. Displays, it is apposite to consider how it arises that Britain's two major aero-engine companies should ally themselves with such differing techniques for V/STOL propulsion and to discuss just what are their differences in philosophy in this field.

It should be said at the outset that neither manufacturer claims that its system answers all the V/STOL propulsion requirements that may arise, and that each system solution is dependent on the precise rôle, configuration and performance attributes required of the individual aircraft design. Herein, almost certainly, lies the prime reason for the parallel development of the Rolls-Royce composite system and the Bristol Siddeley lift/thrust engine. Only time will tell which will attract the greater number of customers.

Consider first each of the systems and their protagonist's reasons for backing them. Rolls-Royce were first in the field and with safety and light weight uppermost among their considerations, selected the composite powerplant as the most effective solution. In this the main propulsion engine is designed specifically to meet the requirements of normal flight—in particular with regard to a low specific fuel consumption during cruise. Separate lightweight lift engines are installed to propel the aircraft during vertical flight.

With this arrangement, safety during VTOL is enhanced by the use of multiple small engines, thus minimizing the consequences of an engine failure, and light weight is achieved because each of the engines is designed for minimum weight in its specific rôle. The lift engines in particular benefit from many factors associated with their operation for only a few seconds during each flight, and also from the reason that this operation occurs only at low forward speed and low altitude. In addition, the fact that they are multiple *small* engines enables them to gain from the benefits of the square-cube law, a naturally occurring relationship between engine dimensions and weight, which results in turbojets of 2,000-5,000 lb. thrust having a lower specific weight than engines of a lower or higher output.

Because of its low cruising consumption and very lightweight jet-lift engines, the composite powerplant is claimed to give the lowest overall engine-plus-fuel weight for V/STOL aircraft. This claim also takes into account the various installational needs of the jet-lift engines. These include the provision of multiple intakes and exhaust ducts; retractable grilles to deflect the air into the engines during forward and transitional flight; gear to rotate the engines ±30° fore and aft of the vertical to achieve a thrust line assisting transition to and from normal flight; and folding doors above and below the fuselage to enclose the lift engine bay.

These features may be said also to be the complications of the Rolls-Royce system, together with the occurrence of ground erosion and gas recirculation into the engines' intakes caused by the high-speed exhaust jets of the lift engines. Not surprisingly it is on these same points that Bristol Siddeley claims to score—simplicity of installation from the use of a single engine for both lift and thrust. This system requires only normal forward-facing intakes and because the hot and cold exhaust flows can be directed horizontally by swivelling the nozzles, engine ground running presents no problems—even during vertical take-off, because the Bristol Siddeley engine is a high by-pass ratio turbofan, and the exhaust is less erosive.

The use of a single engine for both propulsion rôles also means that servicing and maintenance requirements are minimized—an important point when it is considered that the very purpose of military V/STOL aircraft is to be able to operate out of restricted and unprepared surroundings.

The main propulsive features of the Bristol Siddeley system are that all the installed thrust is employed for vertical propulsion; during vertical and transitional flight the resultant thrust vector always passes through the same fixed point near the centre of gravity; and the direction of the thrust line can be simply turned from the vertical to the horizontal or vice-versa in the space of a second, or alternatively can be held at any intermediate angle which may be the optimum for a particular STOL flight path.

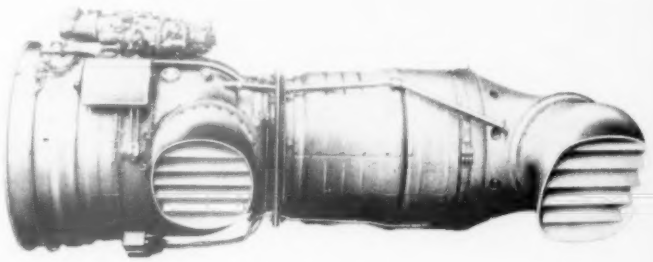
This ability to control the direction of the engine thrust is especially advantageous in the many instances that are likely to occur in which a short forward roll by the aircraft is possible before take-off need be initiated. By starting to roll the aircraft with the nozzles pointing rearward and immediately rotating them into a vertical position ensures that debris is thrown backward, that recirculation cannot occur and that the pilot's view forward and sideways is always clear.

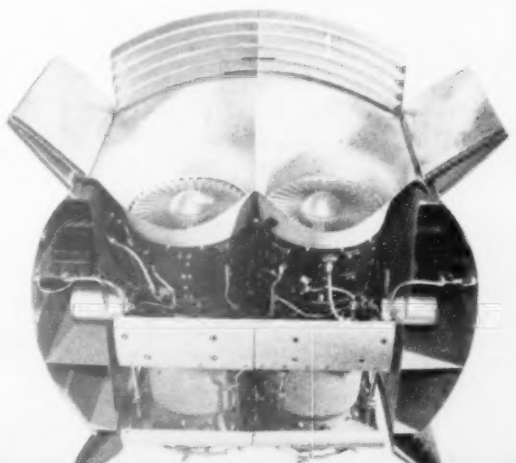
The main points of contention between the two systems lie in the need to carry the "dead" lift engines during normal flight with the Rolls-Royce system—a disadvantage in terms of both weight and cost; and the need to throttle-back the lift/thrust engine so far in forward cruise flight that a poor specific consumption is incurred, also the more disastrous consequences with the Bristol Siddeley system following an engine failure.

Rolls-Royce have made impressive strides in reducing the specific weight of their lift engines and are now promising 0.0625 lb./lb. New materials (undoubtedly including plastics) are employed in their latest engines both with the object of diminishing weight and reducing first cost. The use of plastic compressor rotor blades greatly assists in reducing the loads on, and the weight of, the rotor system and hence also of the bearings and main casings. It also reduces the polar moment of inertia of the rotating assembly as a whole and improves even further the rapid r.p.m. response rate to change of throttle setting on the small lift engines—an important factor in the controllability of VTOL aircraft.

Bristol Siddeley, who have themselves achieved the remarkably low specific weight of around 0.142 lb./lb. with their large Pegasus engine, selected the turbofan cycle as a valuable means both of achieving a low consumption and of providing an engine which achieves its minimum s.f.c. at a lower specific thrust than the pure turbojet. Also they are able to argue that with the engine installed in a high Mach number high-altitude aircraft, the ratio of VTOL thrust to normal cruise thrust diminishes and the degree of throttling is lessened. By the reverse argument, however, the degree of throttling necessary on a subsonic strike fighter is relatively high, thus placing a restraint on aircraft range attainments.

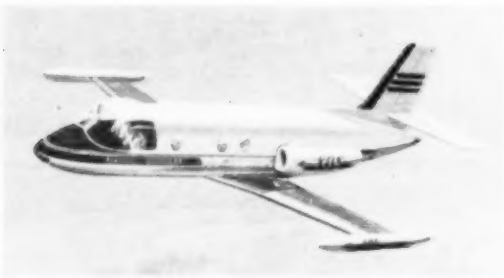
On the matter of ground erosion and gas recirculation, which would presumably prevent the use of reheat for VTOL with the Bristol Siddeley engine, Short Bros. and Rolls-Royce have during the year released various information on tests which they have performed. These show that neither of these problems is nearly so acute as had at first been thought.





Right, top, the Bristol Siddeley Pegasus and, bottom, a pair of Rolls-Royce RB.108s.

Aviation News in General



EXECUTIVE JET.—An artist's impression of the Piaggio-Douglas PD.808 six/10-seat twin-jet executive type, which is due to make its initial flight late next year.

BROUSSARD INTEREST.—Among the airlines which have recently shown specific interest in the Nord/Holste Super Broussard are Lufthansa, Wideroe, and Arkia (Israel). The first production MH260 from the Nord assembly line at Bourges is to fly at the end of this year or early in 1962.

HANOVER VENUE.—Next year's German Aviation Exhibition, held biennially and also in parallel with the yearly Hanover Fair, will be from Apr. 29 to May 8 at Hanover Airport. It is to be "considerably greater in scope" than the last, held in 1960.

NATO'S VTOL FIGHTER.—The Fokker/Republic design for a V/STOL fighter for NATO is said to have a variable-sweep wing and is designed around the Bristol Siddeley BS.100 engine which develops a maximum thrust of 36,000 lb. The Focke-Wulf 1161 project, also a contender, will, like the Hawker P.1150, employ a development of the BS.53 Pegasus.

POTEZ 840 NEWS.—Among those who have recently flown in the prototype Potez 840 four-Astazou feederliner are representatives of Lake Central Airlines, Douglas Aircraft, T.A.I., and Canadian Pratt & Whitney, and Mr. Allen Boyd, chairman of the C.A.B. Between Aug. 28 and Sept. 2, the Potez 840 completed engine-out take-off and landing trials at Istres.

CONGO AIR FORCE.—A Tiger Moth and two Piper PA-20s represent the preliminary equipment of the Force Aérienne Congolaise. A training wing and a liaison wing are being formed.

THE RELIABLE TURBOJETS.—The Pratt & Whitney JT3C-6, which started in airline service with the first of the American jet transports in October, 1958, now has inter-overhaul times up to 2,200 hr. (T.W.A.) and 2,000 hr. (Continental). Qantas has a record of only one JT3C-6 shutdown per 80,750 hr.; the average (up to July 31, 1961) is one in every 20,000 hr. The JT-4 average is 56,700 hr. per shutdown, with United Air Lines recording only one shut-down in 106,125 hr.

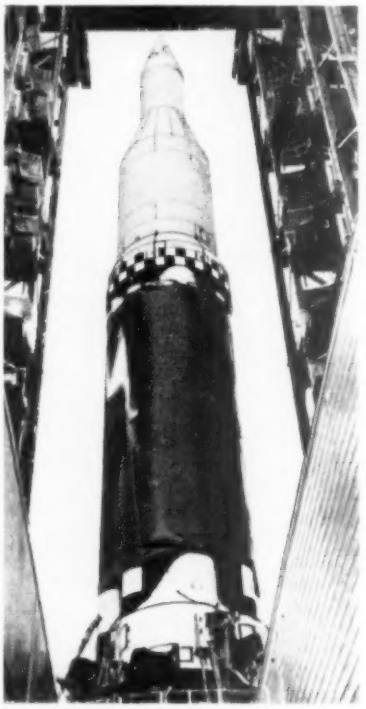
EASTLEIGH TO YEOVIL.—In keeping with its plans to rationalize facilities within the group organization, Westland Aircraft is reported to be moving its small helicopter development facilities from Eastleigh, Southampton, to Yeovil.

MACCHI VISIT.—The Lockheed-Macchi Santa Maria six-seat utility aircraft was brought to this country earlier this week by the Astra Aircraft Corporation, who are the U.K. agents. The Santa Maria was demonstrated at Panshanger from Sept. 25 to 27 before returning to Italy.

U.S. NAVY PURCHASES.—Contracts totalling $274 million have been placed by the U.S. Navy as part of its 1962 fiscal year purchases. These are: $180.1 million to McDonnell for additional production of the F4H-1 Phantom II; $58,038,000 to Chance Vought for the F8U-2NE Crusader; $13,319,328 to Lockheed for the P3V-1 Orion; $2,100,709 to Grumman for the S2F-3 Tracker; $7,145,600 and $7,351,993 to Sikorsky for the HUS-1 and HSS-2; $6,890,340 to Douglas for the A4D-2N Skyhawk. Earlier this year it was announced that intended total purchases for the 1962 fiscal year were to be: Phantom II, 88; Crusader, 72; Orion, 36; Tracker, 48; HUS-1, 70; HSS-2, 42; and Skyhawk, 180.

MORE SKYLARKING.—A British Skylark research rocket, launched at Woomera last week, carried equipment which had been supplied by NASA for investigating ultra-violet radiation in the Southern Hemisphere. It reached an altitude of more than 100 miles.

JODRELL BMEWS.—Because constructional work on the BMEWS site at Fylingdales, Yorkshire, has fallen behind schedule, the radio-telescope at Jodrell Bank is being linked with the BMEWS network for the tracking of ballistic missiles "during times of international tension." The Air Ministry is embodying the necessary equipment.

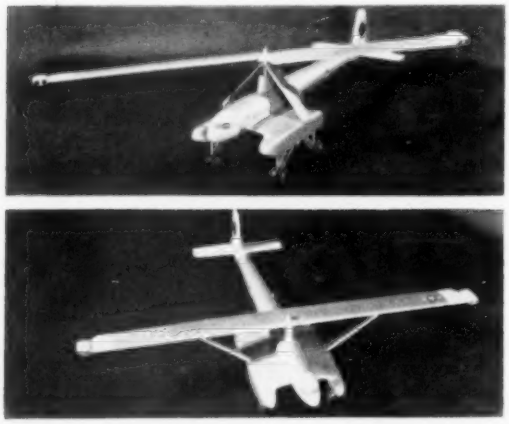


POISED.—First picture to show the 1.5m. lb. s.t. Saturn C-1 booster (with dummy upper stages) in the servicing gantry at Cape Canaveral. It is scheduled for launching in October.

ON TARGET.—A third successful launching of a multi-stage carrier rocket into the Central Pacific was made from the U.S.S.R. on Sept. 20. The dummy final stage landed in immediate proximity to the target centre.

NO NEEDLES!—The president of the Academy of Soviet Sciences, Prof. M. V. Keldysh, has protested against the American plan to orbit millions of fine copper dipoles as part of the Project West Ford communications experiment. It is claimed that they would interfere with "astronomical and radio-astronomical observations."

(More News on page 436a)



HILLER STORC.—The Hiller turbine-powered self-ferrying trans-ocean rotary-wing crane which can operate as a helicopter (top), and then be landed for conversion into a fixed-wing aircraft by twisting one of the two rotor blades in its hub. Both blades are then locked in position as a wing (bottom).

Air Transport

Hovercraft—Fowl or Fish?

BECAUSE Hovercraft defy accurate classification as wheeled or waterborne vehicles, and because their initial development in this country has been in the hands of aircraft manufacturers, they have become accepted provisionally as a type of aircraft. They have been admitted to the S.B.A.C. Display, whence all but the purest of British thoroughbreds are normally banned; they are blessed with a Permit to Fly from the Air Registration Board; and they bear an aircraft registration.

These arrangements were largely a matter of convenience: the logic of requiring the Air Transport Licensing Board to pass judgment on applications to operate Hovercraft services has never been clear. Its full absurdity is now evident however, with the application (No. E2125) from P. and A. Campbell, Ltd. (steamship operators), for a licence to operate Hovercraft across the Bristol Channel to and from, on the one side, ports between Cardiff and Swansea and, on the other side, ports between Clevedon and Ilfracombe.

The application asks for a licence of unlimited duration for unrestricted frequency of service, at fares to be decided, using Hovercraft acquired "from one of several British manufacturers who are at present producing prototypes. The craft needed for this service may not be available for some years. The estimated capacity of these craft is 200 passengers or 20 tons of freight or a combination of both."

The relevance of this application to air transport escapes us. No doubt, if it comes to the point, the A.T.L.B. will prove itself as well able to deal with this kind of application as it is already doing, despite its original lack of expertise, in the airline operating field. But from beginning to end the Campbell application—and the others which will undoubtedly follow—is a maritime matter and should be judged accordingly.

SATCO in Service

A SERVICEABILITY factor of more than 99% has been achieved since October, 1960, with the SATCO Phase I automatic air traffic control system at Schiphol (see our issue for Jly. 22, 1960). The system, consisting of a fully transistorized unduplicated digital computer to calculate flight paths and print progress strips, has been in operational use since mid-January. Operation has been maintained on a 24-hour basis, with a half-day devoted to maintenance each fortnight and two periods of one week each taken up by major work on the equipment.

During regular operation, there were 17 breakdowns, requiring an average of 1¼ hours each to trace and repair. With duplication of the computers (SATCO Phase II) serviceability is expected to approach very close to 100%. The great majority of failures were of transistors; only one of the 30,000 diodes failed, and none of the resistors. Performance of the main memories was "entirely satisfactory." Some early problems with the input/output printers have been overcome by using a newer design, and sound-absorbing "hutches" have been provided so that the printers can be operated within a few feet of the controllers.

One of the important lessons learned at Schiphol is that "on-the-job" training of controllers to use SATCO is unwise. The initial training given with simulated traffic proved to be insufficient and in peak periods controllers tended to revert to the old method of writing progress slips. Changes have now been made to smooth the transition from manual to automatic control.

The Netherlands Department of Civil Aviation reports that all flights are now put through SATCO, that the controllers and assistants appear to be satisfied and that some are already enthusiastic about the system. SATCO Phase II is scheduled for delivery towards the end of 1962.

Clarifying the Jordan Situation

THE Jordanian Council of Ministers acted on Sept. 13 to rationalize the situation which had arisen in respect of airline companies in Jordan (see our issue for Sept. 14, p. 348). At that time, four separate companies had been registered in Amman—Air Jordan of the Holy Land, Arab Airways (Jerusalem), Ltd., Jordan International Airways and Jordan National Airways. On the grounds that they were "contrary to the public interest," the Council cancelled the registration of all four. It had previously withdrawn the operating licence of Air Jordan—temporarily on Aug. 31 and permanently on Sept. 3.

With the object of providing a single operator in the Kingdom of Jordan, the Council ordered the registration of a new company which is to be known as Jordan Airways. Details of its registration, published on Sept. 4, show that it is, in effect, a continuation of the company previously registered as Jordan National Airways. The share capital is one million Jordanian Dinars, of which 25% is owned by the Jordanian Government, 35% by Middle East Airlines and 40% by individuals, including the founders of Jordan National Airways (most of whom are members of the 12-man board). One director will represent the Government, and four will be provided by M.E.A.

M.E.A. is at present operating services over the previous Air Jordan routes and will continue to do so until Jordan Airways begins operations. The fleet is expected to comprise two Viscounts and a DC-3.

Skyways now Independent

ACQUISITION of the Bibby Line holding in Skyways, Ltd., by Eric Rylands, Ltd., means that the company is now independent of shipping interests. Agreement that the Bibby Line shares should be purchased was reached before the end of last year, but was announced only last week following completion of an internal reorganization of the Eric Rylands, Ltd., group of companies.

This group now has three wholly owned subsidiaries, comprising Skyways, Ltd., Skyways Coach Air, Ltd., and Skyways Engineering, Ltd., the last named having previously been known as Samlesbury Engineering, Ltd. Under this reorganization, all the group's aircraft are now owned by the two operating companies, while Skyways Engineering, as the name suggests, is concerned only with overhaul, maintenance and similar activities.

Bibby Line, Ltd., acquired a 50% interest in Skyways, Ltd., in 1955, and held a reduced interest from 1958 until the end of last year.

Mr. David Gaunt has joined the board of Skyways, Ltd., and Skyways Coach Air. The other directors of these two companies are Mr. Eric Rylands, Sir W. Wavell Wakefield and Mr. C. F. Dickson, all of whom are also directors of Eric Rylands, Ltd., and of Skyways Engineering, Ltd. The appointment of Mr. V. J. Doel and Mr. D. J. Davies to the board of Skyways Engineering has also been announced.

GHANA VISCOUNT.—This, the first of three Viscount 838s (9G-AAV) for Ghana Airways, was officially handed over at Hurn, Bournemouth, on Sept. 20.

Air Transport . . . .

The First Appeal—Falcon Loses

ON Sept. 19, the Minister of Aviation informed the A.T.L.B. and the interested parties that he was dismissing the appeal of Falcon Airways against a decision of the Board. The case was of relatively limited scope, involving a once-a-week I.T. flight by Falcon between London, Malaga and Tangier until Oct. 22 this year; but as the first example of the appeals system in action, it is well worth recording.

In his report to the Minister, the Commissioner appointed to hear the appeal—Sir Leonard Stone, O.B.E.—questioned the legality of the B.E.A. practice whereby passengers were flown to Tangier at below-IATA rates by being given two tickets—one for the London-Gibraltar sector at cabotage rates, and one for the Gibraltar-Tangier sector, which is flown by B.E.A. on behalf of Gibraltar Airways. The result of the appeal, said Sir Leonard, should depend on this point: if the B.E.A. practice was "proper and lawful," the appeal should be dismissed, but if it was not, the appeal should be allowed.

The Minister rejected this point of view, saying that, whether or not B.E.A.'s service to Gibraltar is lawful, it is "an air transport service which is being, or is about to be, provided under an air service licence already granted." He therefore agreed with the A.T.L.B. and the Commissioner that no case had been made out for the service proposed by Falcon to Tangier.

The Commissioner's report opens with a summary of the background to the case, in which he notes that the Falcon application (B1253) was made on Mar. 28, 1961, for a Class B Licence for a return service each Sunday from Jly. 2 to Oct. 22, from London (Gatwick) to Malaga and Tangier and return. B.E.A. entered an objection on May 11 on the grounds that its service (jointly with B.U.A.) to Gibraltar and Tangier was adequate, and later asked that Gibraltar Airways should be included as joint objectors. The application was heard by the Board on Jne. 1, and the decision was announced on Jne. 12. It rejected the Tangier service, and limited the Malaga service to the period Jly. 2 to Aug. 28.

Falcon appealed on Jly. 5 on seven grounds which the Commissioner summed up as follows: "First, that the Board wrongly exercised its discretion in allowing Gibraltar Airways to be represented and heard as objectors, and secondly that the Board failed to take into account the evidence of the need and demand for the service to Tangier, that the Board ought not to have been satisfied that the scheduled services operated by British European Airways between London and Gibraltar were adequate, that the Board was influenced by inaccurate evidence as to the capacity available and failed to appreciate the method of the connecting services from Gibraltar to Malaga and Tangier, and that 'the Board did not fairly and properly consider the evidence given on behalf of Falcon Airways, Ltd., and Flightways, Ltd.'"

Subsequently, both B.E.A. and Falcon gave notice that they would produce additional evidence to the Commissioner. These notices, ruled Sir Leonard when the hearing of the appeal opened on Aug. 18, had been received less than the statutory 10 days before and were therefore "out of time." He agreed, however, to proceed with the hearing.

At the appeal hearing, the transcript of the original A.T.L.B. hearing was considered in detail, leading to Sir Leonard's remark that "it appeared . . . normal procedure . . . for the proceedings before the Board to be conducted informally. In my opinion there can be no objection to this provided a distinction is drawn between argument and evidence, and provided that the parties and their representatives do not take advantage of informality in order to mislead the Board. As hereafter appears, that was done in this case."

Sir Leonard's report then goes on to discuss the evidence of Mr. Peter F. Sinclair, a director of Flightways, in respect of an inquiry to B.E.A. for 25 seats each Sunday to Gibraltar from Apr. 30 to Oct. 22, said to be on behalf of the Peterborough Young Farmers Club. This club has a membership of 18, of whom 12 are under the age of 14; it had never made such an inquiry about air travel and the letter to B.E.A. from Group and Personal Travel, Ltd., was "a bogus letter." The production of this letter by Mr. Sinclair to the A.T.L.B. as evidence of a prospective demand is described by the Commissioner as "most reprehensible."

"Just as reprehensible," said Sir Leonard, was some of the evidence before the Board by Mr. Cedric Jones (for B.E.A.) whose answers were "evasive and misleading." Sir Leonard describes as "untrue" the answer by Mr. Jones that B.E.A. "book people from London to Gibraltar and they then book from Gibraltar to Tangier. It is the public who use the combination of the two."

Because both the applicant and the objectors were considered to be equally blameworthy in the conduct of their cases before the Board, the Minister, on the Commissioner's recommendation, made no orders as to costs.

Sir Leonard's report ends with some observations of a general character, of which the first deserves to be writ large in the room at Therese House where the A.T.L.B. conducts its public deliberations. It is as follows:

"If the Board is to continue to conduct its business with expedition it is absolutely essential that all parties, whether they be Applicants or Objectors, and their witnesses who appear before the Board, should treat the Board frankly and honestly. If what occurred in this case became at all general, it would not be possible for the Board to deal with these applications with the informality of its present procedure, and that would mean a substantial slowing down of the hearings before the Board."

Railway Opposition

THE second of the appeals against A.T.L.B. decisions was heard on Sept. 14. The British Transport Commission was objecting to the unlimited licence granted to Morton Air Services (B.U.A.) for a Swansea-Birmingham service.

Approval for one return flight a day would be acceptable, but B.T.C. strongly opposed an unlimited approval. "The time may very well come in the forthcoming winter," said the B.T.C. representative, "when aircraft are grounded. The railways at such a time will be expected to convey the passengers and in that case they are entitled to some form of protection."

The air carrier's view was that its service was designed for business executives who were prepared to pay a little more to save time. The railways were not providing a service for this type of passenger and Morton was not providing a service designed for use by the general public.

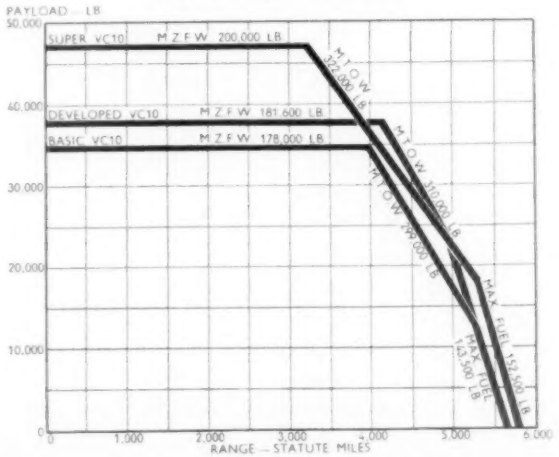
The next appeal, that of B.O.A.C. against the approval of North Atlantic rights for Cunard Eagle, was to be heard on Sept. 26.

The "Safari Thruliner"

BRITANNIAS will replace Viscounts on the British United Airways' Safari service to East Africa on Oct. 2, reducing the journey time to less than 18 hours. Taking advantage of the water-injection 4,445 s.h.p. Proteus 757s installed in the two former Hunting-Clan Britannia 317s (in which respect they are unique), B.U.A. is providing non-stop service in each direction between London and Entebbe, a distance of 4,036 st. miles. The high temperatures encountered at Entebbe make the non-stop flight to London difficult to achieve regularly; no other airline at present flies this sector direct.

The service to East Africa serves Nairobi by way of Entebbe. The Central African service to Ndola, Lusaka and Salisbury is also to be operated by Britannias from Oct. 4. In addition to the two Britannia 317s (G-APNA and G-APNB), B.U.A. has the two former Air Charter Britannia 307s (G-ANCD and G-ANCE) and has recently leased two 312s from B.O.A.C. for two years, principally for trooping operation.

Payload-range of the VC10



Compared on this graph is the payload-range performance of the three versions of the VC10 now on offer. Allowance is made for 2-hr. stand-off at 20,000 ft. at 1.1 VMD.

OPtional Reading—13

IN the first 12 numbers of OPtional Reading the overture of the work has been completed. I have announced the main themes (air traffic control, landing hazards, long- and short-range navigational aids, vertical separation and air/ground communications) but have not developed them. In subsequent numbers I propose, as best as I can, to develop these main themes in greater detail, interspersing them from time to time with passages of "continuo"—as, for example, the two Russian numbers (9 and 11) and the AIREP number (12).

In this matter of development I am conscious, particularly in the airworthiness field, that I shall be straying from the journalistic and the general into the academic and the expert; this is, of course, always a little dangerous for the unacademic and the inexpert, but I have the temerity to do so chiefly because the safe operation of aircraft is essentially a matter in which the pilot, who is inexpert as an aerodynamicist, must find common talking points with the designer, who is an inexpert pilot. From a series of free exchanges between the two there should result a significant improvement in our present-day operations and, perhaps, some guidance for operations of the future.

For the time being, I am content to deal with present operations; we certainly haven't got the subsonic jet fully weighed up yet, much less the supersonic. Here one of the principal fields not yet fully explored is the matter of landing distance and landing techinques—probably the commonest source of today's accidents. So this I propose to tackle first.

When the jet was introduced, the landing-distance problem was put aside: the ICAO Airworthiness Committee, for example, from 1957 to 1959, developed a fairly extensive performance code for the take-off of turbine aircraft, but it left the landing case to be regulated by the old piston-engined code; only now, when accident trends are unmistakable, has the heat been applied. Here are a few landing accidents gathered at random. I am aware that some are open to question as performance cases, but for every accident knocked out of the list I think I could supply two incidents (i.e., not resulting in major structural damage) to take its place.

14.5.59	Douglas	DC-8	Edwards A.F.B.	Heavy landing
26.6.59	B.O.A.C.	Comet	New York	Undershoot
4.2.60	A.A.	707	St. Louis	Overshoot
9.5.60	T.W.A.	707	New York	Heavy landing
7.6.60	B.O.A.C.	Comet	Carrasco (Montevideo)	Undershoot
30.10.60	S.A.A.	707	Nairobi	Undershoot
31.1.61	S.A.A.	707	Zurich	Overshoot
6.2.61	Delta	DC-8	Dallas	Overshoot
24.4.61	J.A.L.	DC-8	Tokyo	Overshoot

In most, if not all, of these accidents the performance of the aeroplane vis-à-vis the landing distance was not even discussed at the inquiry—so great is public faith in the designer and the certificating authority. However, there are now signs that the problem has been recognized, at least by the latter, and in this connection it is gratifying to see that the recent F.A.A. Airworthiness Conference has been discussing an entirely new formula for landing-distance certification. At the time of writing, the official report on this meeting is not available but it is my guess that the new formula, after a good deal of pulling about by the U.S. industry, will eventually find its way into C.A.R.s and, through the medium of next year's ICAO Airworthiness Committee, into the ICAO regulations—presumably as a "Provisional Acceptable Means of Compliance."

One day, when I am out of a subject, I will try to explain the above term, but this landing problem is going to take up enough OPtional Reading numbers as it is and I must get on. However, before breaking new ground, it may be as well to go back to the overture on the subject (OPtional Reading—4), in which I summed up the theme as follows:

> "So until someone gives me the statistical measure of wind speed variability near the ground, the A.S.I. position error at full flap and high angles of attack, the A.S.I. system and instrumental variabilities, the true margin of the equivalent airspeed over the one-g stall, the temporary increase in stalling speed due to the extra loading of the round-out action and the value of ground effect from 50 ft. downwards, I will continue to believe that many of today's landing problems are due to yesterday's 'mush effect'."

On the grounds that, for most people (including myself), it is always easier to understand the problem if one first knows the answers, I have stated the answer to the landing problem as being "mush effect": now and in subsequent numbers I have to justify it. Mush effect is associated with a breakdown in flow, but occurs at an airspeed appreciably above the stalling speed as defined for certification purposes. So, to get a clear datum, the first thing to look at is the stalling speed.

Probably most of us thought that we knew what the stalling speed was, but, asked to produce a definition, it was surprising what variation of answer came up. To the pilot it was, more often than not, "the speed at which the thing falls out of my hands"; to the U.K. designer it was (among other things) the speed at which a large amplitude pitching or rolling motion, not immediately controllable, was encountered (rough description, "nose-drop"); to the U.S. designer it was the minimum speed obtained in the stall manœuvre. Other tenable definitions were the speed at which the aircraft refused to climb on further backward movement of the control column (zero rate-of-climb-speed); the speed at which maximum lift was obtained (one-g); and a few more.

It may be thought that this matter of the definition is a small affair—but this is far from being the case. The landing distance for both piston- and turbine-engined aircraft is at present predicated on an airspeed at the threshold of 1.3 times the stalling speed (usually known at Vs). If the choice of the definition of Vs permits a variation of 10 kt. (which it can); if the certification stalling speed is 100 kt. (which it could be); if the margin of 30% at the threshold is necessary to cater for the other variables (which will be discussed in later articles); and if operational landing distance is certification distance plus 40% (which it is)—then a measured certification landing distance of 5,000 ft. becomes, for operational purposes, 7,000 ft. But if, using a different definition for Vs, the certification stalling speed should really have been 110 kt., and if the same margins are applied (1.3 Vs and 40%), then the operational landing distance (taken as proportional to the square of the threshold speed) becomes about 8,400 ft., i.e. 1,400 ft. more than would have been found in the Flight Manual.

In some of the above accidents the overshoot was less than 1,400 ft. However, I would not tie their causes directly to a mis-measured stalling speed: the case on this has been exaggerated somewhat for the purposes of illustration and because, being at heart a simple man, all my aeroplanes have a certification stalling speed of 100 kt. But it does show that this argument about definitions is far from academic: indeed, so much is this the case that I shall have to devote another number to it before proceeding to the next variable affecting the landing.—C.C.L.

New Data for the DC-8F

DOUGLAS announced last week that the design of the DC-8F Jet Trader (our issue for Apr. 20) has been modified to permit variation of the interior from all-cargo to all-passenger layouts, with four intermediate mixed passenger/freight arrangements possible. As originally announced, the DC-8F had a fixed bulkhead between the forward freight compartment and rear passenger compartment, and would carry 52,000 lb. of freight and 54 passengers.

The bulkhead is now to be a removable one, with at least four possible positions in the fuselage, providing for 24, 54, 84 or 114 passengers. With the bulkhead removed, the DC-8F can accommodate a maximum of 183 passengers in economy class seating. As a pure freighter, the payload is 91,113 lb. on pallets or 94,668 lb. of bulk-loaded freight. The floor will have tracks for seat units or pallets, and provision for removable rollers and guide rails. A typical mixed load would be 84 passengers and six pallets each measuring 81 in. by 110 in., the total payload being 87,440 lb.

A DC-8F demonstrator is being built by Douglas and is expected to fly about this time next year. This will have 18,000-lb. JT8D-3 turbofans, the "4%" wing" and other features of the present DC-8 Series 50. The maximum weights have recently been increased by 5,000 lb. over those originally announced, and the design gross ramp weight and maximum take-off weight are now, respectively, 318,000 lb. and 315,000 lb. The cruising speed is given as 500 knots and the operating range as 3,475 naut. miles with 54 passengers and 54,500 lb. of freight.

Flag Carrier for Luxembourg

DESIGNATED as the country's flag carrier, but previously inactive as an operator, Luxembourg Airlines has now ordered one Fokker Friendship Series 100 with an option on a second and plans to start services between Luxembourg and Paris, Amsterdam and Frankfurt on Apr. 1 next year. Pending delivery of these aircraft the second Friendship prototype will be chartered for crew training and for the first series of services, and Fokker is to provide extensive technical support, with seconded personnel.

The original Luxembourg Airlines was formed in 1947, but ceased operations in 1958. Technical assistance, aircraft equipment and crews were initially provided by Scottish Aviation and later by Seaboard and Western Airlines (now Seaboard World Airlines).

Air Transport . . . .

Points from Project Horizon

The Report of the Task Force on U.S. National Aviation Goals, released by the White House on Sept. 10, was reviewed in our previous issue. Summarized below are some of the arguments developed in the report on subjects of current interest

International Competition

The decline of U.S. flag-carrier participation in the World air-travel market, says the report, calls for concentrated attention by the Government and "the most affirmative effort" by the airlines. In the past 10 years, the U.S. airlines' share of the transatlantic market has declined from 62.7% to 39.8%; between U.S. and South America it has fallen from 80% to 55.4%; and across the Pacific it has declined from 78.7% in 1953 to 67% in 1960.

Figures are included in the report (and summarized in the two tables below) to show the disparity between the number of visitors to the U.S. from various countries and the number visiting those countries from the U.S.; and the still greater disparity between the number of visitors from European countries and the number of seats offered across the Atlantic by the respective national airlines. These statistics throw new light on the recent attempts by the C.A.B. to limit the capacity of foreign airlines serving the United States.

The report goes on:—

"Additionally, foreign flag airlines have been granted access to larger cities in the United States than have been obtained for U.S. carriers in foreign countries. Furthermore, rights exercised by foreign airlines to carry U.S. traffic 'beyond' their gateway points are of greater traffic significance, in almost every instance, than those given the U.S. in exchange. Among these are rights to populous metropolitan areas in the heart of the country which not only result in increased competition with U.S. international operations, but also dilute domestic trunk line business. Every trans-polar route grant from the West Coast to Europe represents some drain on U.S. transcontinental business. And every additional authorization to mid-American cities whittles away at the revenue opportunities of domestic carriers.

"One of the problems in appraising U.S. air carriers' participation in the world air transportation market is that of achieving self-sustaining operations while at the same time permitting participation by foreign flag airlines to achieve their objectives with economic operations. The U.S., by virtue of the large number of Americans travelling in international air transportation, has a market several times larger than the next largest country and, therefore, provides the most hopeful base on which to achieve sustaining operations. As new countries seek to enter the air transport market, existing operators of all countries should make some accommodation and not leave to the American carriers alone the responsibility for yielding part of their markets to the new operators."

Countries with which Air Transport rights are exchanged and operated	Foreign visitors to U.S. by residence, year ended Jne. 30, 1960	U.S. citizens departing U.S. for foreign countries, year ended Jne. 30, 1960
United Kingdom	91,339	223,968
Scandinavia	26,000	54,299
France	25,772	140,641
Netherlands	21,193	46,532
Germany	40,352	144,704
Belgium	5,627	19,910
Switzerland	10,818	12,906
Italy	19,595	78,523
Israel	6,967	9,835
Iceland	800	5,732
Eire	3,600	27,893
Spain	8,701	20,905
Total Europe	254,000	797,211

	Fiscal 1950		Fiscal 1960			
	No. of Visitors	Seats offered	No. of Visitors	% change	Seats offered	% change
Belgium—Sabena	2,450	7,970	5,627	124	64,681	730
Scandinavia—S.A.S.	12,706	17,963	26,210	106	101,183	465
France—Air France	10,433	18,628	25,772	148	92,469	397
Germany—Lufthansa	4,091	—	40,352	890	69,234	—
U.K.—B.O.A.C.	39,919	18,628	91,339	129	155,665	737
Eire—Irish Airlines	1,229	—	3,600	200	23,519	—
Italy—Alitalia	7,050	—	19,595	175	46,585	—
Netherlands—K.L.M.	5,405	19,963	21,193	293	105,354	427
Spain—Iberia	2,610	—	8,701	233	13,715	—
Switzerland—Swissair	3,673	4,023	10,818	192	44,903	1,023
India—Air India	1,890	—	5,883	210	10,664	—

These two tables show the disparity between the flow of visitors into and out of the U.S., and compare the number of airline seats across the North Atlantic with the number of visitors from various countries.

The history of post-War bilateral agreements is reviewed, and reference is made to the development of the "five freedoms" and the so-called "sixth freedom" to carry "beyond" traffic. Since the Bermuda Conference in 1946 between the U.S. and U.K. set the pattern for bilateral agreements, the U.S. has entered into more than 40 other bilateral agreements founded on similar principles. In practice, says the report, some of these principles have been breached by some foreign carriers and in recent years they have come under increasing pressure by foreign governments.

"Certain small countries," the report continues, "believe that their flag carriers cannot achieve economic success in direct competition with U.S. carriers. Accordingly, these countries may restrict U.S. carriers in one way or another, either as to number of schedules or type of service offered. Although our Government may protest, it is usually unwilling to carry its protests to the point of denouncing the agreement or requesting arbitration.

"Much criticism has been made of the manner in which this country has negotiated with respect to routes. It is charged that we have been unduly liberal and have given foreign carriers direct access to more traffic opportunities in the United States than are obtained for U.S. carriers abroad. It is further charged that these foreign carriers, even with fairly modest penetration, have been able to obtain economic benefits far greater than any benefits which our carriers could obtain from traffic generated in the foreign countries concerned. It is also charged that some foreign governments, in bargaining for routes or other privileges, have exerted high-level diplomatic pressure on the U.S. Government, while this country has not exerted similar diplomatic pressure to get routes and privileges for its carriers.

"These charges are directed to a relatively small number of bilaterals under which foreign carriers secure substantially more than our carriers in economic benefits. However, they are important since they involve operations over the rich transatlantic route and afford opportunity to eight of the 12 European carriers, on that route, to obtain more revenues from the U.S. operations than U.S. flag carriers can possibly accrue out of the nationals of the countries these foreign carriers represent. Many of the foreign countries take the position that, while much of the traffic flowing over their routes is generated in the United States and consists of U.S. nationals, it is their country to which the passenger wants to go. According to the Chicago principles of sovereignty, they can deny commercial traffic rights to our carriers unless they receive what they regard as a satisfactory *quid p o quo*.

"Nevertheless, the ever-increasing numbers of foreign carriers attempting to secure footholds in U.S. markets makes it clear that in the future the U.S. must be more sensitive to the relative economic benefits resulting from route exchanges. This involves a more careful trading of routes, as well as better policing of the capacity provisions of our bilateral agreements. Perhaps it is time to raise the question as to whether a bilateral exchange of routes, and hence traffic rights, under Bermuda-type principles any longer affords a valid basis for international air carrier negotiations."

Pooling Agreements

Traditional U.S. economic policy has "always placed heavy reliance on the creative effect of competition" and, although competition has been regulated, it has always been specifically recognized as necessary for the development of an adequate air transport system. In these circumstances, the C.A.B. has never allowed U.S. airlines to participate in pools, and has not officially recognized their existence.

The effects of pools among foreign airlines is discussed in the report, which says that their proliferation makes it necessary to search for effective ways to deal with the resulting shifts in competitive relationships. "For example, we might be prepared to recognize the existence of a pool among foreign carriers operating their services to the United States. On the other hand, when a small country suggests pooling of its service with that of a U.S. competitor, we might seek first a substitute arrangement which would support that country's operation. In some other circumstances, participation of U.S. carriers in pools

U.S. AIRLINE DATA (DECEMBER 31, 1960)
(In Thousands of Dollars)

	Net working capital	Funds deposit with mfs.	Long-term debt	Net equity	Debt/equity ratio
American	$57,676	$49,056	$228,779[1]	$153,319	1.5 to 1[1]
Braniff	$9,999	$3,845	$40,000	$36,706	1.1 to 1
Capital	$7,388[2]	—	$1,017[2]	$43,926[2]	0.03 to 1
Continental	$6,490	$1,331	$37,826[3]	$27,541[3]	1.4 to 1
Delta	$2,813	$3,363	$55,000	$38,393	1.4 to 1
Eastern	$29,009	$14,810	$165,000[4]	$110,591	1.5 to 1[4]
National	($5,828)	$3,167	$33,846	$29,004	1.2 to 1
Northeast	($7,633)	—	$31,376	($13,954)	—
Northwest	$17,285	$4,165	$69,500	$52,193	1.3 to 1
Pan American	$31,400	$19,039	$317,300[5]	$138,440	2.3 to 1[5]
Panagra	$3,731	$84	$19,794	$16,069	1.2 to 1
T.W.A.	$36,051	$17,018	$223,242	$126,042	1.8 to 1
United	$21,256	N/A	$217,052[6]	$173,044[6]	1.3 to 1
Western	$17,093	$9,807	$23,010	$32,584	0.7 to 1
Totals	$226,940	$116,690	$1,461,740	$963,898	1.5 to 1

Notes: N.A. Not available.
( ) Deficit.
[1] Includes $40 million in subordinated convertible debentures.
[2] Places $31.2 million of current liabilities and $12 million convertible debentures in equity.
[3] Assumes conversion of all convertible debentures.
[4] Includes $25 million in subordinated convertible debentures.
[5] Includes $46,971,000 in subordinated convertible debentures.
[6] Includes $25 million of subordinated convertible debentures in equity.
Source: Company Annual Reports.

might be permitted on a case-by-case basis and upon a showing that the total effect would be in the public interest."

Airline Finances

An analysis of the financial "posture" of the 13 major U.S. carriers (11 domestic, counting United and Capital as one, plus Pan American and Panagra) shows that the period up to 1965 will be a crucial one. The report says that the manner in which the financial problems are overcome will govern the industry's development in the second half of this decade.

The ratio of debt to equity (stockholder ownership in the company) for these airlines has grown from 0.6 : 1 in 1950 to 1.5 : 1 in 1960 (see table). This is "well in excess of standards normal to air carrier borrowing."

To support their large capital structure, the 13 carriers had net earnings of $16.3 million in 1960, of which domestic trunkline operations generated only $1.2 million. The total return on investment was 3.43% (2.86% for the domestic trunklines), and the profit margin on revenues averaged 2.02%, well below the standard established by the C.A.B. in its general passenger fare investigation as being necessary "to ensure the retention and attraction of capital in amounts adequate to foster economic health and development." Only one airline reached the C.A.B. prescribed standard in 1957 and only two in 1959.

The domestic trunklines have found themselves in a constant squeeze on earnings. The causes of this profit squeeze are described as "numerous, but many can be essentially traced to excess capacity generated by the jets and reflected in a decline in domestic trunkline passenger load factors from 61.4% to 59.5%. Levels of competition which were perhaps economical with the smaller piston equipment cannot be profitably maintained with large jet equipment."

An analysis was made of the likely ability of the major airlines to meet their financial obligations in the period ahead. From information supplied by the 13 carriers, it appeared that the cash required in the 1961-1965 period totalled $2,543 million. From depreciation and amortization, credits available and sale of surplus aircraft, these same airlines expected to generate $2,332 million, leaving a balance of $211 million which "presumably must be forthcoming from earnings, sale of additional equity or issuance of other debt securities."

This calculation makes no provision for dividends or increased working capital, and can be compared with the $1.2 million earnings of the domestic trunk airlines in 1960. Moreover, $109 million of the balance is required by the six smaller trunklines which, together, had a net loss of $9 million in 1960. The problem in 1965-1970 is forecast to be less acute, with a balance of $35 million required to be generated from earnings plus new financing.

Costs per available ton-mile for the domestic trunklines have increased for the past four years, while load factors have decreased to cause an even more substantial rise in costs per revenue ton-mile. A return to profitability is dependent upon a better control over capacity costs, control over load factor, or securing more revenue per unit of traffic. Further overall fare increases would be "essentially self-defeating at this time. . . . On the other hand, any radical reduction in overall fare levels could erode earnings."

"Earning power—past and present—is the fulcrum upon which the financial fortunes of the airlines rest. Airline capital structures in all their elements are dependent upon earning power. *Any* influence which serves to undermine or destroy earning power threatens the financial solvency of the industry. The degree of profitability which ensues in the intervening years will, of course, determine the industry's ultimate financial position and hence its capabilities to purchase and operate supersonic transports, and other next-generation aircraft, in the early 1970s."

Supersonic Transport

After noting the economic and social justification for the development of a supersonic transport, the report goes on to say that international prestige considerations argue heavily in favour of going forward with it. "The loss of this nation's pre-eminent position in the production and sale of transport aircraft would be a stunning setback. In the light of Russian accomplishments in space technology, it is imperative that the U.S. must retain its leadership in aviation."

The task force recommends that the U.S. SST should cruise in the Mach 3 range and that an intensive applied research programme should begin immediately, to establish the preferred design parameters. Particular attention should be given in this programme to the type of powerplant, the means of achieving the variable wing geometry needed for efficient operations at both sub- and supersonic speed, and the problem of the sonic boom.

On the question of financing the SST, the report says:—

"The over-all costs of a supersonic transport program have been estimated to be of the order of one billion dollars. However, it should be noted that the applied research program necessary to establish the design criteria for the aircraft can probably be carried out at a cost of a few tens of millions of dollars. Certainly there is no need, nor would it be prudent, to commit funds for the total program in advance of the initiation of the aircraft development program.

"It does not lie within the province of this report to delineate in precise detail the nature or the extent of government assistance to the supersonic transport program. It is our opinion, however, that the broad general lines of such a program should embrace competitive design submissions with some financial participation on the part of the competitors in the costs incurred prior to the selection of the preferred design and contract order. The costs involved in the applied research, development, initial production, and testing probably should be borne by the government as an expenditure in the national interest, with consideration given to the recovery of such expenditures or a portion thereof as royalties paid back to the government by the air carriers (either at the time the aircraft are acquired or over the period of their operation)."

It has been assumed that SST scheduled service will become possible on an economic basis at seat-mile costs at or below present levels. Capital costs are estimated to be between $18 and $25 million per aircraft, but in addition extensive ground handling and maintenance facilities will be required. Thus, the total capital requirements of an SST purchase and integration programme for the domestic and international carriers, says the task force, may well be several billion dollars.

Airport Ownership

In view of the recent White Paper on the establishment of an Airport Authority in Britain, the comment on airport finances made in the report is of particular interest. It goes as follows:—

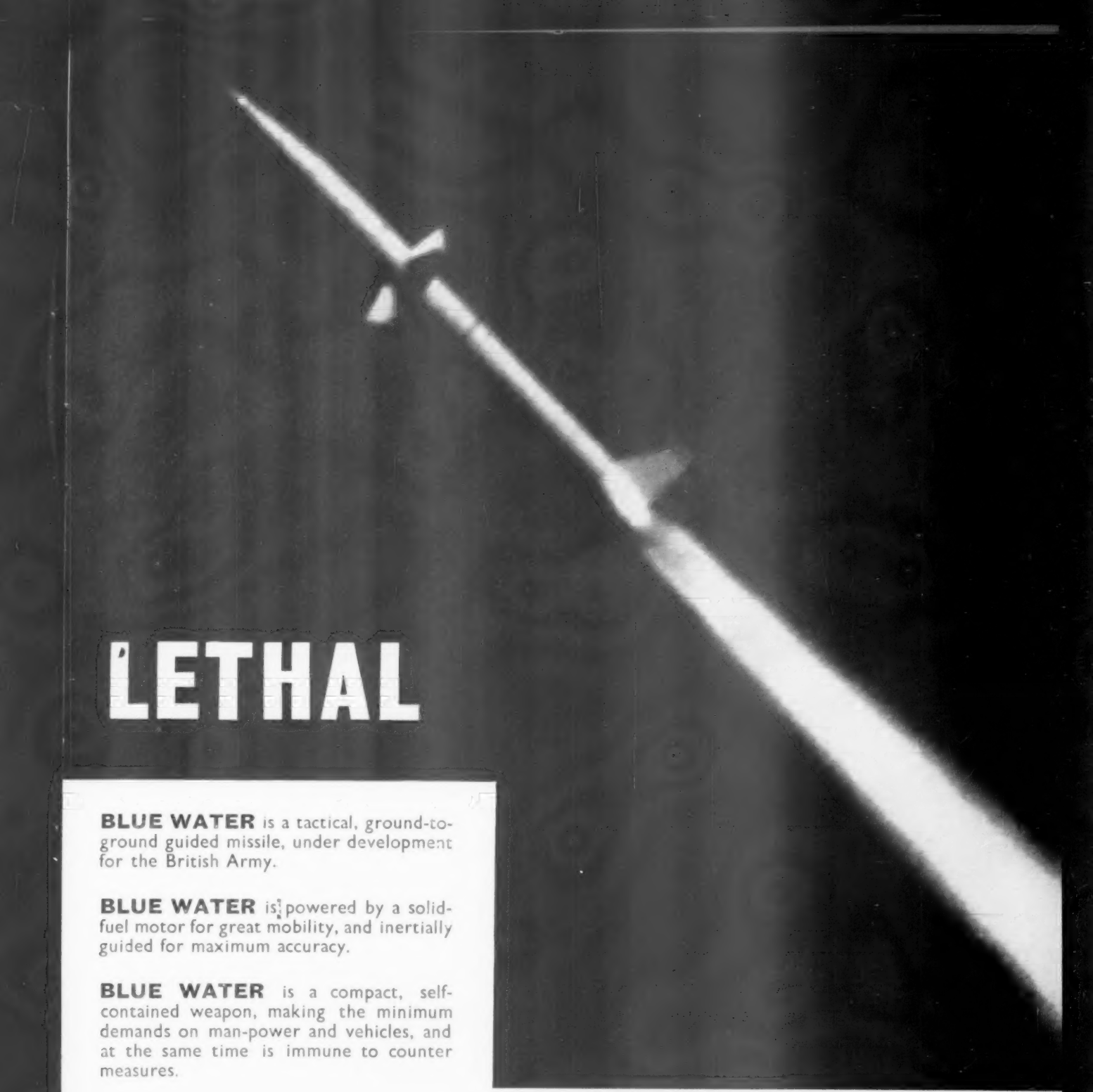
"While emphasizing Federal responsibility and participation, both from a policy and a fiscal standpoint, in the development, construction and operation of the nation's airports, we acknowledge the basic responsibility of local ownership (be it private, municipal, state, or authority) for the financial soundness of the airport's operation. Airports should and must be operated, as other commercial ventures, with sound principles of business governing both capital costs and operating expenditures. Users, regardless of type, should expect to pay reasonable rentals for space used and reasonable fees and charges for services received commensurate with costs incurred by airports on the basis of reasonable and prudent management.

"On the other hand, the operator has no right to make unwise or unreasonable expenditures and expect to be "bailed out" by the user without recourse, or even the right to question effectively the propriety or accuracy of charges. Airports are public facilities, monopolistic in nature, yet unlike other businesses vested with a public interest, with very few exceptions, they are completely unregulated in the normal sense of the word. The normal regulatory approach is unrealistic and is not here advanced. However, while supporting the operator's right to charge reasonable rentals and fees, the user has the right to be assured that charges assessed to him are based on wise and proper expenditures. All elements of the aviation community must recognize these policy considerations and must approach contractual relations with full recognition of the rights and responsibilities of each of the parties involved.

"Funds received from the Federal government by the airport ownership or management should not be included in the rate base on which charges are based nor should the airport be expected to repay such funds. Our airports, as a part of the total air transportation system, are a national asset which makes the bearing of a portion of such costs by the nation as a whole, as distinguished from the particular community, a proper policy. Communities must recognize, however, that certain airports may have to be subsidized indefinitely by the community to gain the wider benefits of access to the skyways of the World."

D

COMPACT MOBILE



LETHAL

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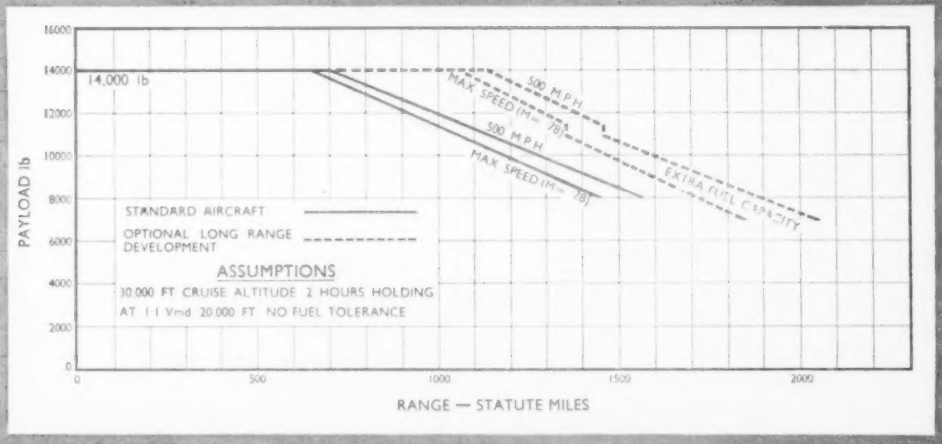
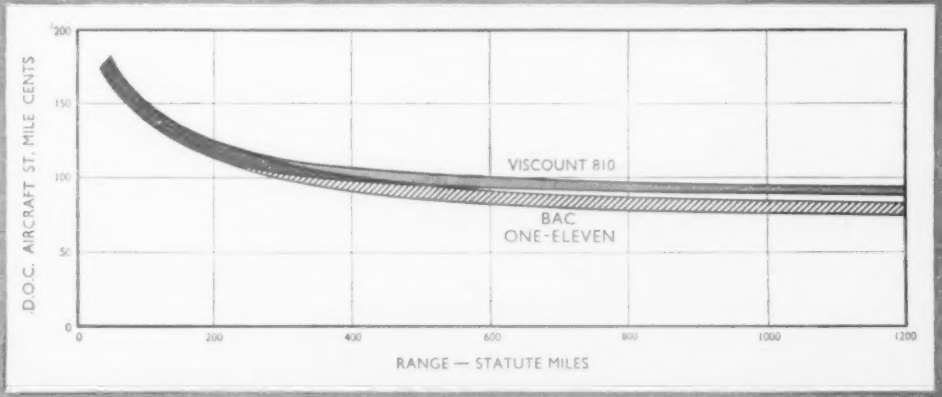
The BAC One-Eleven can carry its full complement of 57 mixed class passengers and baggage at 500 mph for stages of 1,070 statute miles with two hours reserves. It can carry 43 passengers for 1,500 miles

PAYLOAD v. RANGE



ECONOMICS

These bands cover seven separate methods of costing —ATA (1955), ATA (1960), SBAC and those of four airlines



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The Fighting Services

Argentine Awards

A NAVIGATOR with No. 10 Squadron and a Technical Cadet from Henlow are to be presented with a sword and gold medal respectively by Dr. J. Pena Gaona, Counsellor at the Argentine Embassy in London, during a parade at R.A.F. Cottesmore today, Sept. 28.

The sword and medal are the senior and junior trophies presented by the Argentine Air Force to the top cadet graduating from the R.A.F. College, Cranwell, or the R.A.F. Technical College, and to the aircraft or administrative apprentice passing out from one of the R.A.F.'s apprentice schools with the highest aggregate marks.

Winner of the sword is Flg. Off. N. Bonner, who was trained as a navigator at Cranwell and is now with the Victor-equipped No. 10 Squadron. Recipient of the gold medal is Technical Cdt. J. Swinden, now at Henlow Technical College. He is a former Warrant Officer aircraft apprentice at No. 1 School of Technical Training, Halton, having been awarded a prize scholarship to Henlow.

R.A.F. Appointments

THE following are among recent Royal Air Force appointments:—

Air Ministry: Gp. Capt. D. B. Fitzpatrick, O.B.E., A.F.C., and Wg. Cdr. F. E. Earnshaw to the Department of the Chief of the Air Staff; Wg. Cdr. F. A. Hall, M.C., R.A.F. Regiment, to the Department of the Chief of the Air Staff; Wg. Cdr. E. G. F. Hill to the Department of the Air Member for Supply and Organization.

Bomber Command: Wg. Cdr. O. B. Balean, L.D.S., to Headquarters Unit as Senior Dental Officer; Sqn. Ldr. J. Gillespie, M.B.E., to R.A.F. Coningsby as Senior Technical Officer, with acting rank of Wg. Cdr.; Sqn. Ldr. H. D. Hall to R.A.F. Gaydon for standardization duties with the acting rank of Wg. Cdr.

Fighter Command: Wg. Cdr. W. J. Gregory, D.S.O., D.F.C., D.F.M., to R.A.F. Wartling to command; Sqn. Ldr. W. H. Cadamy to R.A.F. Leeming to command the Administrative Wing with acting rank of Wg. Cdr.

Coastal Command: Gp. Capt. W. A. H. Smith, B.D.S., L.D.S., to R.A.F. Aldergrove as Senior Dental Officer.

Flying Training Command: Wg. Cdr. R. H. Johnson to No. 2 F.T.S., Syerston, as Senior Technical Officer; Wg. Cdr. A. J. Paterson to the Ground Officers' Selection Centre, Biggin Hill, as President of the Board.

Technical Training Command: Gp. Capt. C. A. Ball to the R.A.F. Technical College, Henlow, as Gp. Capt., Executive, and Station Commander; Gp. Capt. W. V. A. Denney, L.D.S., R.C.S., to the Dental Training Establishment, Halton, to command; Wg. Cdr. G. C. Baird, L.D.S., to R.A.F. Cosford, as Senior Dental Officer; Wg. Cdr. E. M. Poole, L.D.S., R.C.S., to R.A.F. Bridgnorth, as Senior Dental Officer.

Maintenance Command: Gp. Capt. S. C. Allen, Q.H.D.S., L.D.S., R.C.S., to Headquarters as Principal Dental Officer, Southern Area; Wg. Cdr. S. M. Rigg, M.B., Ch.B., to R.A.F. Boscombe Down as Senior Medical Officer.

R.A.F. Germany: Gp. Capt. R. M. Brown, L.D.S., to Headquarters as Principal Dental Officer; Gp. Capt. I. W. H. R. Cran, M.R.C.S., L.R.C.P., to R.A.F. Hospital, Wegberg, as medical specialist.

More Service News

Missile Ship.—Third of the Royal Navy's guided-missile destroyers, H.M.S. "Kent" of the County class, was due to be launched at Belfast yesterday, Sept. 27, by H.R.H. Princess Marina, Duchess of Kent. A Seaslug system with twin launcher and two Seacat systems comprise the ship's anti-aircraft missile armament. For anti-submarine work it will have on board a Wessex HAS.1.

"Mothership" Co-pilot.—Co-pilot of the Boeing B-52 which carried to altitude the North American X-15 on Sept. 12 before its fastest speed run to date was Sqn. Ldr. Harry Archer. He is a graduate of the E.T.P.S., Farnborough, currently on a three-year exchange posting with the U.S.A.F. serving with both bomber and transport units.

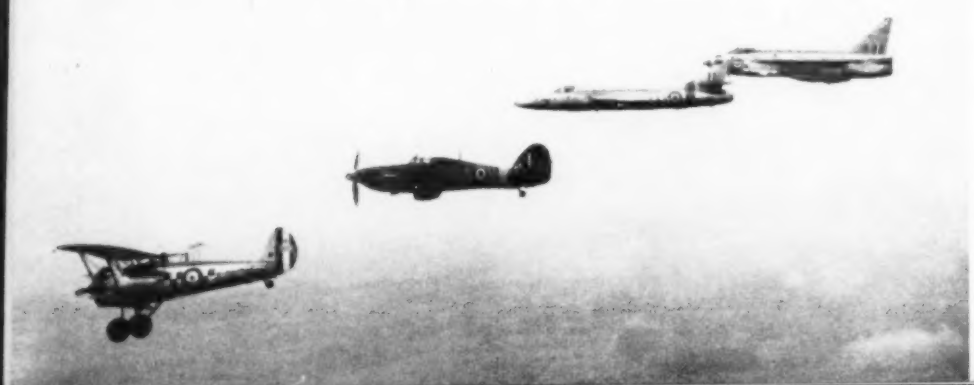
AUSTRALIAN AEROBATS.—The four members of the R.A.A.F. "Black Diamonds" Sabre aerobatic team which is based at Williamtown, N.S.W. Left to right, Flg. Off. H. J. Baston, Flg. Off. J. Fyman, Flt. Lt. B. Weymouth (leader) and Flg. Off. R. Parer.

Gutersloh Terminal.—In preparation for the extended air-trooping programme, which begins next month, a new terminal building/reception centre is being constructed at R.A.F. Gutersloh, Northern Germany, by men of No. 5003 Airfield Construction Squadron. From Oct. 2 Viscounts of British United Airways will be using the station.

Australian Aides-de-Camp.—Two R.A.A.F. officers, Air Cdre. K. Parsons, C.O. of R.A.A.F. Point Cook and Commandant of the Air Force Academy there and Wg. Cdr. C. G. C. Olive, a former Battle of Britain pilot and now a civilian on the Air Force Reserve, have been appointed honorary aides-de-camp to Her Majesty The Queen. They succeed Gp. Capt. D. W. Colquhoun and Wg. Cdr. J. B. Nicholas who have completed their terms of appointment.

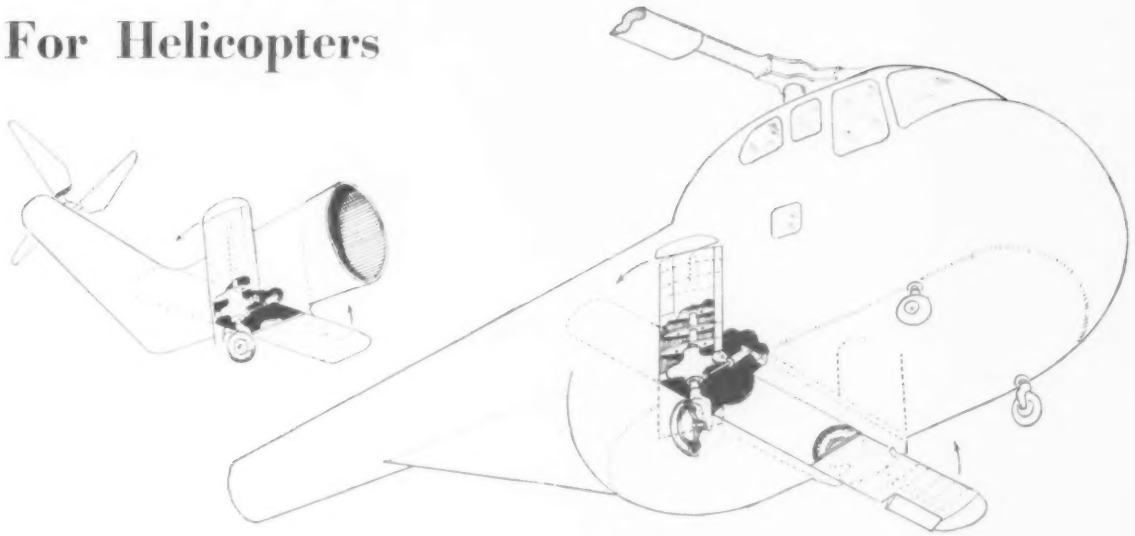
The Goldfish Meet.—Tenth reunion dinner of the Goldfish Club is to be held at the Three Nuns Hotel, Aldgate, London, E.C.3, on Oct. 28, from 18.00 hrs. Principal guests are to be Gp. Capt. T. G. Mahaddie, president of the Pathfinders Club, and Gp. Capt. Rev. C. E. Moxley, principal of the R.A.F. Chaplains College. Details are available from Mr. J. H. Kirkland, 209 Windmill Road, Ealing, London, W.5.

UNDER TRAINING.—Above, first of the Royal Navy and Royal Marine student helicopter pilots to receive basic training from a civilian source are now at Redhill with British United Airways. The instructor in the Whirlwind cockpit is Mr. M. J. Perkis.



FOUR GENERATIONS.—Representative of the fighter types operated by No. 56 Squadron over the past 30 years are the Bulldog, Hurricane, Hunter (in this case a T.7) and Lightning seen in this specially posed picture.

A Retractable Undercarriage For Helicopters



SOME helicopters are fitted with stub wings to relieve the load on the rotor in forward flight but if these wings are fixed, they reduce the efficiency of the rotor when hovering and increase the space required for stowage of the helicopter, which is undesirable when the aircraft is carried in a ship. Also, it is usual to have a landing gear rigidly mounted on the aircraft and this produces unwanted drag forces in forward flight.

To overcome these disadvantages, the stub wings should be made to fold and the undercarriage to retract into a housing in the aircraft structure. As both the wing and the undercarriage are normally located in approximately the same region of the helicopter structure and their retracting motions are complementary, i.e. when the stub wing is "down" the undercarriage is "up," it is suggested that the two might be combined into one unit which is rotatably mounted on the aircraft.

In this way the design of the individual units would be simplified and by selecting the position of the axis of rotation of the combined unit, the mass of the wing and that of the undercarriage could be balanced and a portion of the undercarriage could, if required, be enclosed within the wing structure. The "up" and "down" positions of the wing and of the undercarriage relative to the aircraft structure could be adjusted by inclining the axis of rotation to the centre-line of the aircraft.

The aerodynamic forces on the wing in forward flight could be used to assist in moving the stub-wing/undercarriage unit to the required position. To achieve this, the trailing-edge of the wings could be fitted with controllable flaps which could be independently or collectively set at varying angles to the chord-line of the wings; and when the wing units are locked in the horizontal position, the flap surfaces could be aligned, or moved together in the same sense to vary the forces on the wings.

As well as the normal mechanical means, the rotation of the stub wings could be caused by jets of air or other gases issuing from suitable points on the wing.

In the case of a single-rotor helicopter having tail landing wheels and tailplanes, a landing gear could be incorporated in each tailplane in a manner similar to that used on the main stub wings the tail wheels in the "up" position being housed in recesses in the underside of the fuselage.

A typical application of the suggested scheme to a single-rotor helicopter which also has a tailplane unit, is shown in the accompanying drawings. In this, one combined stub-wing/undercarriage unit is depicted in the forward-flight position with the wing spread and the other in the hovering position with the wing folded.—P. V. HOARE.

PUBLICATIONS RECEIVED

Stephen Morris, by Nevil Shute. This book contains two related aviation novels (the second is entitled "Pilotage"), in both of which Stephen Morris is the principal character. They were the first complete novels written by the late Nevil Shute, and have remained unpublished until now. 276 pp. 5 in. by 7½ in. William Heinemann. 16s.

Aircraft Annual 1962. Edited by John W. R. Taylor. Contents of this annual *pot pourri* range from the reminiscences of a First World War fighter pilot to assessments of contemporary military and naval aviation. Excellent value for the young enthusiast. 96 pp. 9½ in. by 7 in., illustrated. Ian Allan, 10s. 6d.

The Strategic Air Offensive Against Germany, by Sir Charles Webster and Dr. Noble Frankland. Comprising three volumes of narrative account and a volume of appendices, this is the first fully detailed official history of the work of Bomber Command in World War II. Based on 10 years of research into British, German and U.S. records, it traces the development of strategic bombing and the necessary equipment for it, describes the War-time operations in detail and deals with the often-controversial decisions over which targets should be attacked. Vol. I, 522 pp.; Vol. II, 322 pp.; Vol. III, 332 pp.; Vol. IV, 530 pp.; 6¼ in. by 9¼ in., illustrated with photographs, maps and charts. H.M.S.O., £2 2s. per volume.

Fifty Years of Japanese Aviation. Compiled by Katsu Kohri, Ikuo Komori and Ichiro Naito. This original Japanese volume had as its first object the illustration of all the types of aircraft either built in, or operated over, Japan since 1910. More than 900 photographs and informative captions achieve this object. The second part of the book is an illustrated narrative account of Japanese aviation to date, accompanied by an extensive chronology. For English readers, the book comes with two smaller volumes comprising English translations of the photo captions and narrative, by Kazuo Ohyauchi. 232 pp. 8 in. by 11¼ in., illustrated, and two volumes of 170 pp. each, 6 in. by 8½ in., unillustrated. The Kantosha Co., Ltd., No. 601 Kojun Building, 6-Chome, Ginza, Chuo-Ku, Tokyo. Price $18.75.

Punch With Wings. A cartoon history of the Royal Air Force, comprising an enjoyable selection of humorous drawings which have appeared in the pages of Punch from 1843 to 1960. The selection was made by David Langdon. Royalties from this book go to the R.A.F. Benevolent Fund. 128 pp. 7 in. by 9¼ in. Arthur Barker, 16s.

Shock Tubes, by J. K. Wright. A monograph for all who use shock tubes in the study of physical problems associated with high-speed flow. The author was a principal scientific officer at the Atomic Weapons Research Establishment until recently. 164 pp. 4¼ in. by 7¼ in., illustrated. Methuen and Co., Ltd. 13s. 6d.

Jet Engine Manual, by E. Maugham and A. Peace. This third edition of a useful little handbook for engineers appears in a larger size, with the presentation revised for easier use. The contents have been fully revised to cover current jet engine practice. 156 pp. 4¾ in. by 7¼ in., illustrated. George Newnes, Ltd., 15s.

Flying the Riley 65

No. 106 in the Series by John Fricker

ALTHOUGH the name might be unfamiliar in this country, there is no mistaking the shape; and if the Riley looks remarkably like the Cessna 310, this is because basically it *is* the well-known high-performance American executive twin. What Riley Aircraft, Inc., of Broward County International Airport, Fort Lauderdale, Fla., have done is to revamp older models of the Cessna with a number of modifications to improve their performance, comfort and handling, and to offer them as new, with normal warranties and nil-hour engines.

This does not, of course, alter the fact that they remain reconditioned aircraft. But, as we saw at Panshanger last week, where Keegan Aviation, Ltd., who operate as European distributors, were showing their first demonstrator, it does make it possible to offer a Riley 65 in this country with full IFR equipment, including a complete Class One Collins radio set-up as standard, plus auxiliary fuel and finish to choice, at rather less than the basic cost of a new Cessna 310.

There are no extras of any description to be paid for with the two Riley models, which comprise the lower-powered version, with two 240-b.h.p. Continental O-470-M engines, and the type corresponding to later Cessna 310s, which have fuel injection to bring their IO-470 engines up to 260 b.h.p. for take-off. The lower-powered version costs £24,500, delivered and duty-paid to the U.K., while the other amounts to £28,500 in this country. A new Cessna 310F costs, in basic form, about £27,400, excluding radio and full flight instruments.

With the 240-b.h.p. Continentals, as fitted to the Keegan demonstrator, G-ARRR, the Riley 65 has about the same performance as the more powerful Cessna 310F. It is difficult to imagine improving the streamlining of the sleek Cessna, but this has been achieved by "laminarizing" nearly half the metal skin of the airframe, including the fuselage forward of the cabin, and the leading-edges back to half-chord on the tailplane and fin. These surfaces are free from protruding rivet heads or skin overlap, and are filled with a hard two-tone epoxy resin paint resistant to erosion from rain or normal icing.

Another change is a redesigned exhaust system eliminating the twin augmentor tubes above the Cessna's nacelles in favour of short extractor pipes below. This is claimed to contribute to the lower noise level of the Riley 65 and also to result in cooler engine temperatures. Particular attention is paid to additional soundproofing, and the entire nose section, including the nosewheel well, is lined with tinfoil-covered insulating material. The cabin area is sprayed with flock-type soundproofing before its leather upholstery is applied, and the additional rear windows are double-glazed.

The final external modification is the replacement of the steeply raked Cessna front screen, and its central supporting strut, by a moulded one-piece windshield of thicker plastic. All-round view remains similar to that in the 310, being very good except laterally, where it is restricted by the flat nacelles and fat wing-tip fuel tanks. As in the Cessna, the latter—each of 50 U.S. gal.—provide the main fuel stowage, but the Riley has two 19 U.S. gal. auxiliary tanks as standard in the rear of the engine nacelles. Total fuel capacity is therefore 116 Imp. gal., giving a range of well over 1,000 miles.

As a "customized" aeroplane, the Riley can be furnished in any desired colour, and the interior of G-ARRR's cabin was a tasteful extravaganza of red, beige and gold leather. Even the dual push-pull handwheels had been gilt-finished, as had the Scott oxygen console (another standard fitting) in the roof. Interior lighting had been extended aft into the rear cabin, where there is a bench seat and lap straps for three persons. Behind that is the 200 lb. baggage compartment, which also has an external access door above the retractable wing-root step.

Instruments have both ultra-violet flood illumination and eyebrow-type individual lighting, and have been rearranged to give a more compact flight presentation on the left. Radio is in the now-standard central location, and in the Riley 65 includes Collins VHF (360-channel trans/rec, 90-channel trans and 190-channel VHF/VOR rec), ILS/VOR and glide-slope, a Lear/Motorola ADF-12 and Narco marker beacon receiver. This standard equipment is virtually to full airline standards.

From what I remembered of the Cessna 310, which was described in this series on Oct. 23, 1959, the Riley was otherwise little changed in cabin and control layout. I found the individual front seats, which slide for rudder reach, and are also adjustable for back angle, extremely comfortable, and with Kevin Keegan on my right for briefing purposes, I taxied out over Panshanger's rough turf to try the Riley. Nosewheel steering, which is through 15° each side of centre before freeing to castor, did not seem over responsive, but with differential toe brake and engine, ground controllability is good.

In flight over Essex, the Riley 65 reveals its completely aerofoil nacelle section with exhaust extractor pipes now located underneath, and moulded one-piece screen.

Photographs copyright "The Aeroplane and Astronautics."

With the Dove, which also has a castoring nosewheel, the Riley is one of the few aircraft that the Keegans can taxi in to their blister hangar at Panshanger, and turn inside to taxi out again. With nearly 10 ft./sec. absorption capacity, the undercarriage takes out the worst effects of the bumps on grass, but the long nosewheel oleo appeared to be bottoming at times.

To save it from being hammered for too long, 15° of flap were lowered for take-off via the electric selector, which permits an infinitely variable setting. All three conveniently and logically situated trim wheels were selected neutral, and after a short engine check, we were ready to go. The Cessna/Riley has a spring-loaded elevator circuit to help low-speed stability and control, but on opening up to full power, the artificial download immediately ceased to be apparent.

The elevator, in fact, is surprisingly potent, even at very low speeds, and I found myself pump-handling somewhat during the first take-off. The Riley 65 is restricted to a gross weight of 4,600 lb., and with only two-up and half-fuel, acceleration was very rapid indeed. G-ARRR required no effort to keep straight during the brief ground run, and with a little aft wheel flew off at about 65-70 m.p.h., with a bleat of stall warning.

On a runway, it would be preferable to hold the aircraft down to its V_{mc} of around 80 m.p.h., but to spare the nosewheel, I lifted the Riley off as soon as possible. Safety speed of 93 m.p.h. and best single-engined climb speed of 111 m.p.h. followed in rapid succession, as I selected wheels up and observed the accompanying nose-high trim change. Best rate of climb is at 135 m.p.h., and at max. continuous power of 27 in. Hg and 2,500 r.p.m., the Riley maintained well over 1,600 ft./min. to our selected 5,000 ft.

I liked the businesslike way the Riley got on with the job of flying; it leapt briskly into the air, reached its cruise altitude in virtually no time at all and, throttled back to 22 in. Hg and 2,300 r.p.m. (about 65% power), immediately settled "on the step" to indicate around 190 m.p.h. This trues out to about 205 m.p.h., and is remarkably good for a fuel consumption of about 18 gal./hr. At its optimum altitude of around 8,000 ft., the Riley will cruise at 220 m.p.h. T.A.S. on 65% power.

After a couple of years and quite a number of types, my recollections of the Cessna 310 were sufficiently vague to lead me to a complete reappraisal of its handling. After carefully trimming it out in all three axes, with the low-geared but light trim wheels, I found the Riley positively stable except laterally,

Except for some relocation of instruments, the cockpit of the Riley 65 remains similar to its basic Cessna layout.

where it was neutral to port and positive to starboard, after a vigorous deflection of the control wheel. The ailerons proved quite brisk, once the inertia of the tip-stowed fuel had been overcome, and remained acceptable down to the minimum approach speeds.

Control harmony proved slightly unusual, with the rudder rather on the heavy side, although not normally needed for accurate turns, and an unusually light elevator. Trim changes overall were small, and could usually be quickly and accurately cancelled, so that the overall effect added up to an easy and effortless aircraft to fly. It would seem to lend itself well to instrument flying, even without the optional autopilot. Noise level is moderate and a very comfortable ride is achieved.

To try the clean stall involved a strong pull-force before retrimming, on throttling back, and a slow fall-off in speed accompanied by the intermittent blip of the undercarriage warning horn. This was joined at 80 m.p.h. by the stall warning horn, but almost immediately afterwards came a really pronounced aerodynamic buffet that shook the spring-mounted instrument panel as well as the pilot's teeth.

I did not remember such excellent natural stall warning in the Cessna 310, but it is certainly present in the Riley 65. The breakaway, clean, eventually came at around 70 m.p.h., and involved a straight nose-drop and fairly rapid recovery.

Lowering the undercarriage below 130 m.p.h. results in the biggest trim change likely to be encountered in the Riley, but the nose-down tendency is still not pronounced. It is in any case countered to a certain extent by flap extension.

With some power applied, I pressed the Riley through the still-considerable warning buffet into an all-down stall, which took place at the remarkably low I.A.S. of about 55 m.p.h. It was accompanied by an innocuous port wing drop.

One of the main results of the clean-up accompanying the Riley conversion seems to be a drop of about 10 m.p.h. in the indicated stalling speed of the Cessna 310. Most of this becomes T.A.S., since position error at 65 m.p.h. is around 10 m.p.h. So this is a real achievement, and is reflected by a similar reduction in the minimum control speed. With the port Continental feathered, I took the Riley down to its quoted V_{mc} of 82 m.p.h. both clean and with everything down, at full power on the live engine, and there was still a little rudder and aileron in hand.

The foot load on feathering an engine is not high, and can be quickly cancelled out by a flick of the rudder trimmer. With

Even with the lower-powered 240-b.h.p. Continentals, the Riley 65 has a creditable single-engine performance.

only cruising power on the live engine, the speed fell slowly to 150 m.p.h., at which height could be comfortably maintained, with the addition of slight nose-up trim. Opening up the live engine to full power, and reducing speed to the optimum 111 m.p.h. gave an indicated 400 ft./min. or more climb on the V.S.I., and also resulted in running out of rudder trim, with a light residual load.

Just for fun, after lowering undercarriage and flap, I tried a simulated overshoot on one at 3,000 ft., and rather unfairly left the gear down. With the airspeed still at V_{mc} and almost full right rudder and aileron, I could not get the Riley to climb away, but it refused, on the other hand, to lose any height. With the 260-h.p. version, it would obviously be possible to get away with this normally unwise manœuvre.

Landing the Riley proved a very straightforward operation, even on Panshanger's short N-S grass strip, and 90 m.p.h. on finals was adequate for an easily adjusted approach. The responsive elevator really pays off at this stage, and is powerful enough to hold the nosewheel up during a runway landing.

It seems that the Riley claims for improved performance over the standard Cessna 310 are justified to the tune of 10 m.p.h. or more all round, and for its price it appeared to me to be an extremely attractive proposition. Operating costs, assuming 10% annual depreciation, are quoted as £21 an hour for a 400-hr. U.K. utilization, giving a figure of 1s. 11d. per mile at 220 m.p.h. cruise speed, and 4½d. per seat-mile with five persons on board.

Leading Particulars

Dimensions.—Span, 36 ft.; length, 27 ft. 1 in.; height, 10 ft. 5 in.; wing area, 175 sq. ft.

Weights.—Empty, 3,000 lb.; disposable load, 1,600 lb.; full fuel (116 gal.), 835 lb.; oil, 20 lb.; four persons at 170 lb. each, 680 lb.; available for baggage, 65 lb.; max. gross, 4,600 lb.

Performance (260-b.h.p. version in parentheses).—Never-exceed speed, 246 m.p.h.; cruise speed, 65% power, 220 m.p.h. (235 m.p.h.); initial climb, 1,800 ft./min. (2,100 ft./min.); single-engine climb, 390 ft./min. (410 ft./min.); single-engine safety speed, 93 m.p.h.; stalling speed, clean, 78 m.p.h., all-down, 65 m.p.h.; service ceiling, 21,500 ft.; single-engine ceiling, 8,700 ft. (9,500 ft.); take-off distance, 810 ft.; landing run, 630 ft.; max. range, 1,400 miles; ultimate endurance, 6 hr. 20 min.

Surveying Soviet Space Technology

ONE of the most interesting and revealing lectures on the progress of Soviet rocketry and astronautics was heard by the British Interplanetary Society in London on Sept. 22. The speaker was Dr. G. A. Tokaty*, the former Soviet rocket specialist who, in 1945-47, held the position of Chief Rocket Scientist of the Soviet Government in Germany. The title of his address was "Soviet Space Technology."

Dr. G. A. Tokaty.

Dr. Tokaty began by reviewing some Western attitudes to the Soviet space programme.

"In June of 1959," said the lecturer, "I received, from an influential Western—not British—organization, an invitation to testify before a powerful constitutional body and in the Press, loudly and in categoric terms, that the Soviet sputniks, laikas, lunar probes, etc., were no more than 'rude Communist propaganda,' a 'Big Red Lie.' A few months later, at the McDonnell Aircraft Corporation, St. Louis, Missouri, looking at the capsule of the Mercury project, a well-known scientist and educator said to me: 'Well, here we have something new, real and outstanding, while the Russians make only propaganda announcements.'

"Then, in April of 1961, a few hours after Major Gagarin's successful re-entry and landing in the U.S.S.R., when I refused to give yes and no answers, my poor interviewer in a Los Angeles hotel stated boldly that 'the so-called Gagarin's space flight,' too, may well prove to be 'another Russian hoax.' Finally, in a document (now right in front of me) prepared for official use, a Western intellectual advises his superiors that, according to results of his 'first-hand study,' the Russians and 'other Eastern Slavonic nations' appear to be 'much less inventive and imaginative' in science and technology than the Anglo-Saxon nations.

"And so on, and so on. I could enlist dozens of books, pamphlets, articles, radio broadcasts and even T.V. plays, in which so-called 'Russian experts' continue to depict the Soviet Union as the old Tsarist Russia with its notorious long-bearded Muzhiks and Oblomov-like intellectuals, with no real scientific and technological progress."

The realities are quite different, went on Dr. Tokaty. The Communist October Revolution had destroyed, abolished and replaced that Russia by a fundamentally different state organization called the Union of Soviet Socialist Republics, or the Union of S.S.R., or the U.S.S.R., or simply the Soviet Union, in which there are no private or even semi-private industrial companies or corporations, research establishments or laboratories, educational establishments or technological publications. Everything and everybody in the U.S.S.R. belongs to the State, is employed, financed, directed and controlled by the State. The State itself "belongs" to the Central Committee of the Communist Party of the Soviet Union.

The second basic difference is that the Soviet Union is a country of single and permanent official ideology. "Whoever you may be, whatever you may be doing, your efforts are predetermined, once and forever, by this single and permanent aim. And so are the efforts of the entire Soviet people." Tsarist Russia, on the other hand, was a "jungle" of philosophies and ideologies with no uniting national purpose.

There are many other differences, but these two are the decisive ones. They make the U.S.S.R. not only a country of a dictatorship with a very high degree of centralization but also one of the most (or, perhaps, the most) dynamic state formations in modern history, which knows clearly where, why and how it wants to go. And this is precisely what puts such fields as aeronautics and space technology in an advantageous position in comparison with that in, say, the United States and in the United Kingdom.

After surveying the work of such pioneer Russian scientists as Tsiolkovsky, Konstantinov, Meschevsky, Zhukovsky and Tsander—covering the period from 1881 to the early 1930s—the speaker went on to consider other significant developments in the formulative years of Soviet rocket engineering.

Immediately after the October Revolution, Lenin empowered Professor Zhukovsky to begin the building of a completely new and up-to-date centre of aeronautical research, under the name "Central'ny Aero-Gidrodynamicheskii Institute," C.A.G.I., the Soviet equivalent of N.A.C.A.; this was initiated in 1918 and completed partly in 1924 and fully in 1927.

Equally important was the creation in 1919 of the now famous Zhukovsky Academy of Aeronautics in Moscow, with its ever-improving teaching and experimental facilities. Today there are in the U.S.S.R. 15 such academies, institutes and higher colleges of aeronautics and space technology exclusively; plus a number of departments and chairs of aeronautics and astronautics in universities. Each has laboratories of its own.

All the 15 institutions are not only teaching, but doing basic research. Thus the problem of preparation of aerospace scientists, engineers, technologists and technicians was solved drastically and effectively. The consequence is that the present Soviet aerospace intelligentsia is not only the most numerous but also the most directed and the most effective in the World.

This, too, is not all. The "Piatiletkas" (i.e., five-year plans for industrialization) gave the U.S.S.R. a modern aerospace industry, which, in turn, created favourable conditions for the creation of huge research establishments. One of them is the "New C.A.G.I." (built in 1933-38), with superb wind-tunnels and other facilities. The second is the "newer New C.A.G.I.," the Institute of Fluidmechanics of the Academy of Sciences

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A Soviet development of the German V-2 known in U.S. terminology as the T-1 and which Dr. Tokaty identifies as the Pobeda. Its range is about 560 miles.

Model of a "spaceship" built in accordance with drawings made by Tsiolkovsky in 1903.

in Novosibirsk (built in 1959-60), with academicians S. A. Khristionovich and M. A. Lavrentyev in charge.

Then there are the Central Institute of Aerospace Propulsion Systems (C.I.A.M.), the All-Union Institute of the Aerospace Materials (V.I.A.M.), the Flight Research Institute (L.I.I.), the Scientific Testing Institute of the Soviet Air Forces (N.I.I.V.V.S.), the Scientific Testing Institute of Air Armaments (N.I.I.A.V.), the Scientific Institute of Air Instruments (N.I.I.A.P.), the State Rocket Scientific Research Institute No. 1 (N.I.I.—No. 1), etc., etc. Both by their quantity and quality, they are all as impressive and powerful as those in any any other country in the World. What is even more important, their activities are well planned, well co-ordinated, well aimed, and absolutely free from financial worries.

This led Dr. Tokaty to consider the formation and work of the G.I.R.D., a group dedicated to the study of rocket propulsion systems, which came into being in 1931. This organization subsequently became the State Rocket Scientific Research Institute.

After Tsander's death in 1933 G.I.R.D. continued his work and initiated new projects. A rocket built and tested early in 1933 was powered by a liquid-oxidizer engine; it was 245.7 cm. long, 160 mm. in diameter and weighed 20 kg. It rose to an altitude of 4,500 m. Another liquid rocket, GIRD-X, was a further development of a Tsander project. Its length, diameter and weight were respectively 2.2 m., 0.14 m. and 30 kg. It was fired successfully in November, 1933, but did not reach the design maximum altitude of 5,000-6,000 m.

The active members of the G.I.R.D. comprised the "third generation" of Soviet rocket engineers—those who were educated under the new regime. V. P. Glushko, S. P. Korelev, M. K. Tikhonravov, A. G. Kostikov, Yu. A. Robedonostev, L. S. Dushkin and others—today leading figures in the design and production of Soviet rockets, sputniks and spaceships—all began their efforts in the G.I.R.D.

For example, Tikhonravov designed, built and tested successfully (1934) a liquid-fuel rocket. For its time, it signified a remarkable leap forward. The rocket was supposed to be secret. But in 1945 the lecturer's group had found drawings of it in the Nazi Air Ministry. Tikhonravov developed not only interesting rocket projects; he also published many valuable articles and a book, "Raketnaya Technika" (1935), full of detailed information on rocket design.

A. G. Kostikov, on the other hand, devoted his talent and energy to the development of small military rockets called "Katyusha"; the work of his group began in 1936 and in May, 1940, this rocket was accepted for mass production and was widely used on the Russian front in World War II.

S. P. Korolev's work on rockets began in the early 1930s. In 1934 the Ministry of Defence of the U.S.S.R. published his book, "Rocket Flight in the Stratosphere." In the years that followed he worked in the Ministry of Aircraft Production, then in the Ministry of Armaments, then in the Rocket Research Institute—in each case being in charge of rocket research and development. In 1945 he was made responsible for the further development of the German V-2.

Some years later his group designed an inter-continental ballistic missile, the successful launching of which was announced on Aug. 27, 1957. Today he is one of the chief designers of the Sputniks and the Vostok capsule-carrying rockets. This leading rocket authority is a highly imaginative and inventive engineer with tremendous dedication.

Then there is V. P. Glushko, one of the outstanding experts in the field of liquid propellent rocket engines. He, too, entered this field in the early '30s. Together with G. Langemak, Glushko published (1935) a book on "Rockets, their Construction and Application," which influenced the future of this field. For his part, Pobedonostsev—a gas dynamicist and former member of the C.A.G.I. staff, joined N.I.I.-No. 1 in the late '30s and worked all the time on the aerodynamic problems of rocketry. After the War, for several years, he was in charge of a large group of German engineers who worked on the Peenemünde V-2.

Among the younger Soviet rocket men should be mentioned I. A. Merkulov, I. S. Dushkin and A. H. Lyul'ko. In 1935, while an engineering student, Merkulov designed, built and tested (1936) a two-stage rocket. Its first and second stages were propelled, respectively, by a gunpowder motor and by a "uniflow" jet-engine. In 1937, a development of this rocket system was mounted on a conventional Air Force fighter, as a booster and showed good results.

In March, 1941, said Dr. Tokaty, he was visited by Merkulov and L. K. Baev. They placed on his desk drawings for a completely new scheme for a two-stage rocket; this was much more advanced than anything he had seen before. There was a general feeling that the two bright young rocket engineers must be given a chance to go ahead with their bold idea. But the Soviet-German war, which began two months later, made this impossible.

The first Soviet experimental rocket fighter, basically of the Me.163A type and calibre, was designed by V. F. Bolkhovitinov in 1939-40; built in 1940-41, it was transported to one of the Moscow military airfields for flight testing in October, 1941. The rocket motor for this particular project was designed in 1937-38, built in 1938-39 and tested in 1939-40 by Dushkin. Dushkin is undoubtedly one of the most outstanding figures behind the present growth of Soviet aerospace technology.

"I have good reason to believe," said Dr. Tokaty, "that now he is about to complete long-term work on a new rocket propulsion system which will give the U.S.S.R. new advantages in aerospace development. He began with an engine of the performance of the well-known HWK 109-509 and finished up with a monstrously powerful rocket engine."

Post-war Progress

If the Soviet Union had so many rocket scientists, technologists, engineers, projects and prototypes, why did they not have rockets and jet aircraft until much later after the War?

There are reasonable explanations: (1) It is not true at all that there were no rockets in the Soviet Union; "Katyushas" of several types were in mass production and mass use in 1941-45. (2) The main industrial centres of the U.S.S.R. had been either occupied by the Germans or evacuated to the East and this caused serious delays. (3) Resources and efforts had to be concentrated on the immediate needs of defence. (4) Soviet industry was still young and inexperienced. (5) As admitted by the XXth Congress of the Communist Party itself, Stalin and his lieutenants had committed too many mistakes in the preparation of the country's defences.

One reads and hears time and again that the present Soviet space achievements are due to "hundreds of German rocket scientists and engineers deported from Peenemünde and Berlin to Russia." But what are the real facts? Peenemünde, Berlin and other rocket centres had been destroyed by Anglo-American bombing fully or partly. At least 130 leading rocket scientists and technologists, with their theories and projects, had been evacuated and later on were taken to the United States. Wernher von Braun and General Dornberger were among them.

The underground factory of V-2 rockets in the Harz mountains had been captured by the U.S. Army, quickly dismantled and sent, together with its staff, to the United States. Nothing was left behind.

The U.S.S.R. did not get a single leading V-2 rocket scientist or administrator, not a single complete rocket factory, not a single new project.

Some time later, said Dr. Tokaty, in his presence Marshal Stalin said to Col.-Gen. I. A. Serov: "This is absolutely intolerable. We defeated Nazi armies; we occupied Berlin and Peenemünde; but Americans got the rocketists. What could be more revolting and more inexcusable? How and why was this allowed to happen?"

Dr. Tokaty added: "The only thing we could do in the circumstances was to sort out the ruins, to put pieces together and to study them. Well, we succeeded. With the help of

A Soviet surface-to-surface tactical missile developed from the T-1. External differences include a modified nose-cone, twin parallel external conduit, and a flared skirt added at the tail for stability reasons. The picture was taken in Red Square this year.

ordinary German engineers, technicians and workers, we restored not only the general picture but also some laboratories and workshops. Some time later, all this had been transported to the U.S.S.R., where work was resumed on a wider basis. Such was the real truth."

Speaking of their impressions of Peenemünde, he said that they were quite clear on three things: (1) In the field of original ideas and rocket theories, the U.S.S.R. was not behind Germany; in some respects it was even ahead of Peenemünde. (2) In the field of practical technology of rockets of the V-2 calibre the Russians were definitely behind the Germans. (3) Having seen and studied Peenemünde, they suddenly came to the conclusion that there were in the U.S.S.R. rocket engineers as capable as anywhere else.

Dr. Tokaty said that he stated this in his detailed report to Mr. G. M. Malenkov and to the C.-in-C. of the Soviet Air Forces. One year later, in March of 1947, he made the same statement at the meeting of the Politbureau and of the Council of Ministers of the U.S.S.R. "In this sense," he said, "we, the Soviet aerospace scientists and technologists, were not worried by the fact that the leading rocket engineers of Peenemünde found themselves in the U.S.A. What we really needed badly was the practical technological experience." And this, too, was obtained much sooner than was anticipated. With the help of hundreds of German workers and ordinary engineers, who were transported to the U.S.S.R. in 1945-46, the V-2 production was restored fully, with some improvements as compared with that at Peenemünde.

From September, 1949, there existed in the U.S.S.R. a full-scale serial production of big single-stage rockets (including greatly improved versions of the V-2, under the name "Pobeda") with a maximum range of about 900 km., and a fairly reliable guidance system. These were built under Soviet administrators and engineers, by Soviet workers, from Soviet materials, on Soviet soil.

Some of the Germans had been sent home. The others continued working on isolated problems in isolated places, under Soviet scientists. To generalize: the Peenemünde V-2 level of 1944 (before the Anglo-American air raid) was reached by the U.S.S.R. roughly in 1946-47, while in 1949-50 it was far above that level in terms of both quantity and performance. The first Rocket Divisions (armed with V-2s and Pobedas) of the Soviet Armed Forces had been formed in 1950-51. The exploration of the upper layers of the atmosphere by V-2-type rockets began in the autumn of 1947. From 1949, it was continued by Pobedas.

This led to the question asked dozens of times in various countries: are the present Soviet space achievements due to mere good luck or to something else? The Soviet philosophies do not involve "good luck" . . . (they) demand that any education and scientific knowledge must have an aim, a purpose.

The aims of Soviet space technology were, and are, two-fold: strategic, and space exploration. Bearing this in mind, Marshal Zhigarev, then the C.-in-C. of the Soviet Air Forces, in autumn of 1946, in Berlin, said: "We must admit that our V-2-type rockets do not satisfy our long-term needs; they were good to frighten England, but should there be an American-Soviet war, they would be useless. What we really need are long-range and reliable rockets capable of hitting target areas on the American continent. This is an aim that should dominate the mind and efforts of your rocket group."

On Mar. 14, 1947, in the Kremlin, at a meeting of aircraft and rocket designers, G. M. Malenkov, in turn, made it quite clear that the programme of V-2-type rockets did not conform to the long-term aims of the country. "No, Comrades."—he said—"I am not happy with our V-2s; we cannot rely on such a primitive weapon; besides, should there be another war, it would be a war not against Poland; our strategic needs are predetermined by the fact that our potential enemy is to be found thousands of miles away."

One day later, on March 15, at the meeting of the Politbureau and the Council of Ministers of the U.S.S.R., Stalin made the aim even clearer. "Under Hitler, German scientists have developed many interesting ideas," he said with utmost seriousness. "This 'Sänger Project' seems to represent one of them. Such a rocket could change the fate of the war. Do you realize the tremendous strategic importance of machines of this sort? . . . The problem of creation of trans-atlantic rockets is of extreme importance to us."

Such was the general line; so were formulated the strategic needs of the country. Accordingly, the Soviet Government undertook a number of steps which changed the scale and pattern of rocket production. On March 15, 1947, Stalin personally suggested, and the Council of Ministers agreed immediately, forming a special State Commission for the study of the problems of long-range rockets.

It consisted of Col.-Gen. I. A. Serov (1st Deputy Minister of NKVD, chairman); Prof.-Col. G. A. Tokaty-Tokaev (chief scientist and deputy chairman, from the Soviet Air Forces); Prof. M. V. Keldysh (from the Ministry of Armaments); Prof. M. A. Kishkin (from the Ministry of Aircraft Production); and Maj.-Gen. V. I. Stalin.

Concentration on Long-range Rockets

This was an extraordinary decree. It signified a turning point. It was made known to the rocket groups already in existence and influenced their further work very sharply. Towards the end of 1947, as A. G. Kostikov put it, "everybody wanted to design a transatlantic rocket."

In November-December of 1947 the state of rocket technology in the U.S.S.R. was roughly as follows:—

(1) The problem of small military rockets had been solved fully and completely.

(2) Missiles of the V-1 calibre (but of different types) and V-2-type rockets were already in serial production.

(3) Rockets of the Pobeda type were being designed.

(4) There were already two draft projects of long-range rockets. One of them, known as "Project TT-1," was developed by Dr. Tokaty's group and presented to the Government in September of 1947. It was a three-stage liquid-fuel rocket for extremely high altitude and orbital flights. Had the group been allowed to continue its work without interference from outside, the U.S.S.R. might well have succeeded in putting a Sputnik round the Earth in 1950-52.

"But for reasons which had nothing to do with the project itself or with our professional qualifications," said Dr. Tokaty, "we found ourselves in a difficult position. Towards the end of 1947 our work was paralysed. Some of us were compelled to seek refuge in the West. The others were arrested. The rest had to wait. Here I should like to mention that Professors Keldysh and Kishkin did not take part either in the project or in our tragedy."

Politically and ideologically, the lecturer went on, he was not an admirer of the Soviet Government. But this did not prevent him from having a high opinion of them where rocket

technology was concerned. "I am in no doubt whatever that no other government has contributed to the growth of space technology as effectively as the Government of the U.S.S.R. They made up their minds a long time ago. They instructed the corresponding learned bodies to work out a single long-term national programme of space technology. They have never been reluctant to provide the necessary sums of money and supporting facilities."

In 1949/50 rockets of the Pobeda type were in actual production and use for both military and space exploration purposes. In 1954 the second of the above-mentioned two multi-stage rocket projects was accepted (it will be called "project U.S.S.R.-1"). In April of 1956 several U.S.S.R.-1s were ready for test. In August of 1957 *Tass* announced to the World that the Soviet Union had fired successfully an intercontinental ballistic missile—the U.S.S.R.-1. Finally, on October 4, 1957, Sputnik I began circling the Earth.

None of these events was surprising, because there was in the U.S.S.R. a general policy, a national plan of Space research and development.

Here, again, we could learn from the experience of "those Russians." They realized a long time ago that rocketry is the elite of modern science and technology, which cannot be successful under non-experts. Accordingly, all Soviet ministers, deputy ministers, top administrators, planners and co-ordinators of aerospace efforts are distinguished aerospace scientists, technologists and engineers. It is, therefore, easy for them to understand each other. They do not need to be accompanied to governmental meetings by advisors and consultants. If this is added to the fact that there exists a single central Commission for the co-ordination of all the space research and development work all over the U.S.S.R., which also consists of eminent experts in the field, it becomes clear that Soviet space technology has every reason to be as successful as it is today.

When one analyses the already accomplished results and studies numerous publications, broadcasts, etc., one begins to see and to feel "nearly physically" that Soviet space technology moves into the future with great confidence. Figuratively speaking, it does not make a single step forward until, and unless, everything behind is absolutely clear. No experiment or design is carried out until, and unless, the theoretical aspects of the problem (or problems) have been studied.

"Do not say B, if you haven't yet said A; whatever the specific character of your work, it must be carried out in such a manner that A will be followed by B, and only B. B will be followed by C, and in no case by D or E or anything else." These are the well-established traditions of Soviet aerospace technology. Rightly or wrongly, the Soviet philosophies assert that astronautics is too complicated, too expensive and too important to be allowed to grow in any other manner. This explains, at least partly, why the Soviet Union has so few failures in rockets and Sputniks.

The As and Bs of the method emerge logically from the general programme of space research, which is based on the idea of a systematic step-by-step expansion of efforts. The same general trend can be observed in the total rocket thrust, in the sizes of the vehicles themselves, etc. One would expect, for instance, that during the next 3-4 years the total thrust of heavy Soviet liquid-propelled carrier rockets would be nearly doubled.

Dr. Tokaty said that he did not believe that this would be achieved in a single rocket motor. But he did believe that it could be achieved by combining powerful rocket motors with special-purpose jet and ramjet engines. And this is precisely one of the fields of intensive investigation in the U.S.S.R at the present time, the speaker added.

Such a sharp increase in the total thrust would mean that the problem of delivery of H-bombs (as we know them today) by long-range rockets would be solved fully and finally. It would also mean that, for exploration purposes, the U.S.S.R. would be able to put into orbit Sputniks of much greater sophistication.

"A rocket engineer will understand immediately that the combination of rocket motors and jet and ramjet engines will require practically a new rocket vehicle. And the Soviet designers are working on it now. On the other hand, the multi-stage vehicles already in existence and use are still far from being perfect. This became particularly clear after Gagarin's and Titov's flights. Hence, the conclusion that during the forthcoming years a good deal of effort will be devoted to the further improvement of existing vehicles.

"It is also known that there has existed in the U.S.S.R., for a number of years, a powerful group of scientists and engineers which works on the problems of building a real spaceship. There is no specific information on the progress of this project.

"Finally, there are good reasons to believe that the U.S.S.R. is now working very intensively on the project for placing a permanent space station in orbit around the Earth. The general ideas of the project are not new; but whether or not it is supposed to house people or to be an automatic station, remains unknown, at least officially. However, exploiting once again the basic philosophies guiding Soviet space technology, I would suggest that it will be an automatic station with no provision for cosmonauts."

Apollo Command Centre

AN extensively equipped Manned Space Flight Laboratory is to be established by NASA in Houston, Texas; it will be situated "on a thousand acres of land to be made available to the U.S. Government by Rice University."

The Laboratory will be the command centre for the manned lunar landing mission and subsequent manned space flight endeavours. It will be utilized to design, develop, evaluate and test the spacecraft for Project Apollo as well as all its subsystems, and to train the astronauts who will operate them.

Funds sufficient for work to begin on the new facility were authorized by Congress in the current fiscal year. Total cost is expected to be about $60m.

First Mercury Orbit

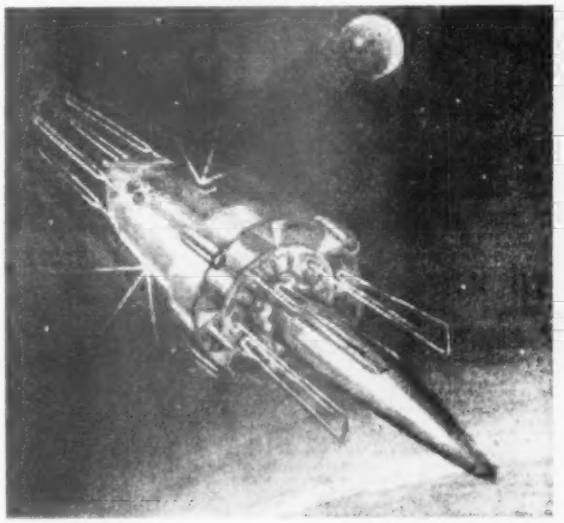
IN the news recently was an important step towards the launching of an American astronaut into orbit taken on Sept. 13 when the MA-4 Mercury capsule carrying a "crewman simulator" was successfully recovered after completing one orbit of the Earth. Full details of the impending test mission were given in THE AEROPLANE AND ASTRONAUTICS on Aug. 31, 1961, pp. 230-1.

Contract for a New Saturn Booster

FROM NASA's latest announcement on the subject of the Saturn C-3 booster, it would appear that North American Aviation have virtually swept the board in securing development contracts for this vehicle. Not only will the first stage employ two North American Rocketdyne F-1 engines developing some 1.5m. lb. s.t. but North American's Space and Information Division have now been selected to develop the high-energy S-II upper stage, which will use four liquid oxygen/liquid hydrogen engines—also by Rocketdyne—delivering a total thrust of 800,000 lb. The 10-vehicle development programme for the upper stage alone will cost about $140 million.

The two-stage vehicle will be capable of placing an 80,000-lb. spacecraft in orbit at 300 miles. For missions requiring escape velocity, it is proposed to add a third stage (S-IV) with six 15,000-lb.-thrust Pratt & Whitney LR-119 engines, employing LO$_2$/LH$_2$. This could launch lunar spacecraft weighing up to 30,000 lb.

Tentative plans call for the use of Saturn C-3 to place Apollo spacecraft (carrying three men) in lunar orbit.



This picture by an artist friend of Major Yuri Gagarin—and verified by him as "realistic"—purports to show the appearance of Vostok I in orbit (complete with the controversial tail annulus). It appeared in *Pravda* on Sept. 17.

Personal Flying

CLARIFICATION of the current range of aircraft produced or projected by the Beagle Group has come following acknowledgments by managing director Peter Masefield of the many inquiries received at Farnborough. In describing the time scale for the eight different aircraft in the Beagle pack, he says: "We are, in fact, entering a comprehensive tooling programme—such as has not previously been undertaken for British light aircraft production—thereby ensuring full interchangeability of spares and a higher standard of finish than would be possible with hand-built types. Equally comprehensive will be a flight development and certification programme including tropical trials, which will ensure that production aircraft will be delivered to a high standard of reliability and with the best possible handling and maintenance qualities.

"As a matter of sales policy, we intend to concentrate first upon the home market in the U.K. for each type, so that we can build up a strong and satisfactory "after-sales" and spares service before aircraft are delivered abroad. In due course, we shall look forward to establishing a widespread network of representatives, distributors and agents at home and throughout the World."

Of the eight Beagle types, two will be available from production deliveries from November, 1961—the four-seat Airedale, at £4,750, and the three-seat Terrier, at £1,995. After these, some time must inevitably elapse between the completion of prototype trials and the selling of production examples of the newer designs.

First production deliveries of the commodious Beagle B.206, which aroused so much interest at Farnborough, are scheduled for early 1963, at a basic price of less than £30,000. These five/seven-seaters will be powered by two 310-b.h.p. Continental GIO-470 geared flat-six engines which are equipped with fuel injection.

Next in the time scale will be the Beagle-Miles M.218A, a four-seater light twin powered by two 100-b.h.p. Rolls-Royce/Continental O-200 engines. Provisional price of this Gemini replacement has now been adjusted to £7,000, and a more powerful version, the M.218B, has been announced with two 145-b.h.p. Rolls-Royce/Continental O-300 engines. These types are scheduled for mid- and late-1963, respectively, the M.218B being planned to sell for somewhere in the region of £8,000.

Its single-engine version, the M.117A, will also follow late in 1963, for production deliveries, as a two-seater with a 100-b.h.p. O-200 flat-four powerplant. Its basic price has been revised to a provisional figure of £3,500, while its four-seat version, the M.117B, with the more powerful 145-b.h.p. O-300, should cost about £4,250 and is expected to be available early in 1964.

No price has yet been fixed for the little single-seat Beagle-Wallis WA 116 autogyro, which should be available for military liaison and civil sport possibly late in 1963. The Beagle Group has obviously got a busy time ahead of it, but has already shown an impressive ability to meet its deadlines.

• • •

A new low-cost single-axis autopilot has been introduced by Tactair Inc. for single-engine light aircraft, and is to be marketed in the U.S. at a price of $495. Designated the Tactair T-101, the pneumatic unit controls heading and attitude via the ailerons, and makes use of the substantial background of company experience with the production of three-axis autopilots.

The T-101 incorporates its own self-contained inertial guidance system which detects both roll and yaw. The entire unit, weighing only 4 lb., contains only five moving parts and three basic elements—two aileron actuating bellows and the combination sensing and command control unit, which can be mounted on the instrument panel or at its bottom edge. The autopilot can be overriden at any time by the pilot without damaging the actuators, and this is the recommended method of changing course when the unit is engaged, although a turn control knob is provided as a refinement.

Air suction to operate the T-101 comes either from the engine vacuum pump or an outside venturi. Plans for adding other automatic flight features such as course selector, pitch control and altitude hold are well-developed and are expected to be announced in the near future.

• • •

More than 100 Beech Queen Airs have been sold since production started late in 1959, the 100th, 101st and 102nd having been purchased by the Lockheed Missiles and Space Company for executive and engineering personnel use. Lockheed has in production at widely dispersed sites such projects as Polaris, and Agena satellite systems, including Discoverer, Midas and NASA space research vehicles. The Queen Airs, with their 200 m.p.h. cruising speeds, will play a vital part in assisting the rapid progress of these programmes.

Photograph copyright "The Aeroplane and Astronautics"

MAESTRO'S APPROVAL. — The Beagle B.206X prototype executive twin in its Farnborough bronze and white finish gets an approving once-over at Shoreham from Capt. O. P. Jones, doyen of British transport pilots. He was one of 40 members of a pilot consortium which contributed ideas for the ideal cockpit layout.

• • •

● Piper Aircraft recently produced its 2,000th Apache, which is probably the most popular light twin ever built. The milestone Apache, N4478P, was purchased by an Iowa executive of a building construction firm.

● Another Taylorcraft has been ordered by the Alouette Flying Club at Biggin Hill, and should be available within the next few weeks. Ground training has started with regular Thursday evening lectures.

● At a full meeting of the Herefordshire County Council on Jly. 29, it was unanimously agreed to reconsider the purchase of Shobdon as a civil airport. A questionnaire has now been circulated to assess requirements for club and charter flying in the area, and the response is being considered at a further council meeting.

● Members of the Herts and Essex Aero Club at Stapleford airfield logged more than 560 hours flying during July. This was the highest number since the club was taken over by Warnell Aviation last October, and 100 more than in June. Twelve student pilots went solo during July.

● Indifferent weather during August restricted activity at the Denham Flying Club, and put one of its Colts out of action for most of the month after it had been blown over in a local squall, damaging the main spar. Ground training has also started at Denham, with lectures on Tuesday evenings.

● The Lancashire Aero Club is now operating its Piper Colts, a pair of which has joined a Tri-Pacer and three Autocrats in the club fleet. In July, 241.25 hr. were flown, a total which was beaten in August by more than 24 hours. Barton airfield is soon to have its permanent radio facility operating on 123.5 Mc/s, and an instrument course is being started for licensed pilots.

● The Norfolk and Norwich Aero Club is growing fast, and last month gained 31 new members. For an experimental period, the flying committee is to divide its efforts into gliding and power sections. It is hoped that this will prove of value in extracting every ounce of enthusiasm from gliding and power pilots for the promotion of their particular interests.

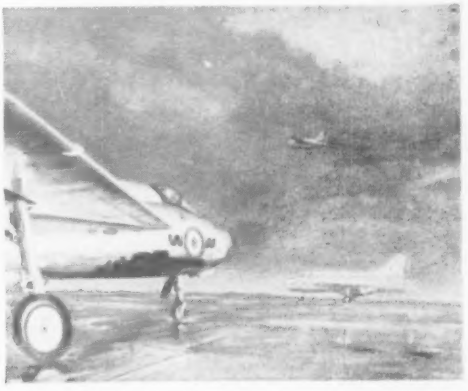
Aviation in Pictures

A selection of paintings by aviation artists from the exhibition now being held at Guildhall, London.

Photographs copyright "The Aeroplane and Astronautics"

"Return to the Fold," by A. Davison Coulson.

"Rendezvous," by David Shepherd.



"Thunder and Lightning," by C. W. E. Waller.

"Mossy Preston's B.E.2E. over Brooklands," by Harry Cooper.

"Lancaster M.R. off St. Eval," by E. J. Hewitt.

"Escort," by John L. Palmer.

Gliding Notes

by Dr. A. E. Slater

LATEST of the "qualifying competitions," which are being held to decide who may enter for next year's National Championships, was held at Lasham for four days from Saturday to Tuesday, Sept. 16-19. Fifteen machines were entered with 30 pilots, including two teams from the Derbyshire and Lancashire Club, one from the Southdown, and C. G. Ross from the Scottish Gliding Union with a home-built Skylark 3f which took him and two friends 2½ years to construct.

Everything was grounded on the first day by a gale, said to be the outer edge of "Hurricane Debbie," which caused a 117-m.p.h. wind at Ballykelly in Northern Ireland. Next day was wet and overcast.

On the third day, when I looked in, an inversion at 1,100 ft. above ground put a lid on the thermals, which, on the "convection cell" theory, should have been just half a mile apart (2½ times the thickness of the convection layer). People were towed into the smooth air above and sank into and through the thermals as they were not much good.

Ann Welch had set a short task, down-wind to Thruxton and back against the wind, so as to make sure that, if Thruxton was within reach, most people would at least score. This is in contrast to the Polish custom, which she saw in action this year and disapproved of, whereby the outward leg of an out-and-return is against the wind, so that, unless the thermals are really powerful, hardly anybody makes the minimum distance required to score.

On the 4th day at Lasham, when the task was distance along a line to Retford, due north, pilots were again released from tow above the top of the convection layer, which was marked by small bits of cumulus. This time David Scallon made 40 miles to Princes Risborough in a Skylark 2, Stuart Morison took a passenger 25 miles in an Eagle, and E. J. Meddings and Harry Midwood may have just scored.

This event was an experiment in running a "qualifying competition" with the absolute minimum of personnel, so that I saw a crew member keeping the time-sheet, and the task-setter became an observer at the finishing line. Ann's name for it was a "utility competition."

* * *

NOW that Lasham Gliding Society has got its lease of the land, it has already begun to look different. All the rotting roof and sides of the large hangar have come off and the skeleton awaits reclothing with more durable material.

Plans for the new clubhouse, to be built on the present trailer park, are on exhibition; but the present clubhouse, perhaps in a fit of jealousy, anticipated things by setting fire to itself at 05.30 hrs. on the last day of the contest. However, it was put out before the whole building caught alight, though the entrance and part of the kitchen are badly damaged.

* * *

SOUTHDOWN GLIDING CLUB'S Open Day on Sept. 17, when members' friends and relations were to be given rides, was somewhat frustrated by the previous day's proximity of "Hurricane Debbie," which managed to overturn the T-21b as it was being trundled back to the hangar with nine people hanging on, the instructor having decided the gale had become too dangerous for launching. The machine was pointed out of wind, yet it was the leeward wing that went up.

For the Open Day, the hangar entrance had become a buffet, but rain in the morning kept the public away. However, there was an unusually fascinating grey overcast full of waves and horizontal veils of cloud, continually changing shape; yet, in spite of its stable appearance (in the meteorological sense), small rags of cloud would suddenly appear here and there and rush up into it at high speed, as they do under a cold front.

Firle Beacon is now under barley for two years and the club is flying from the adjoining Bostal Hill to the S.E. It has no level ground, but winch launches to 1,400 ft. are possible in S.W. winds; while on the N.E. side is the steep escarpment over which most of the soaring at the historic 1922 meeting was done.

* * *

AT Dale Fort Field Centre in Pembrokeshire, the course on "Weather and Bird Movements" has ended with some surprising information by a radar expert, Mr. W. G. Harper, who had been deputed to investigate radar echoes of birds because airfield control is hampered by them.

Mr. Harper gave two examples of birds using upcurrents other than thermals and slope lift. One was a thunderstorm front, which gave a big echo as it approached the radar. Separated from it by a narrow gap, a thin line showed up on the screen, extending the width of the storm but just in front of it. This was the echo of a party of swifts which, he said, had gone there because they "knew" they would find a lot of insects which had been lifted in the belt of upcurrents just preceding the storm.

The other example was a sea-breeze front, showing a radar echo of birds soaring along it. This echo was photographed repeatedly at Chelmsford by Marconi's, and the photos were joined up into a film which showed the motion much speeded up. The front was actually in two parts. One moved inland from the Sussex coast as far as the North Downs, and the other from the Essex coast right across East Anglia from S.E. to N.W.

These fronts contained the only clouds present over England, for a strong anticyclone was centered over the North Sea; but the radar reflections were from birds, not clouds, and they actually showed, in addition, birds flying towards the front, presumably because they recognized it as a source of insect food.

* * *

Ken Williamson's lectures are fascinating. Why are individuals of the same species of bird larger in the Arctic than at lower latitudes? I have often tried to think up an aerodynamic or meteorological reason, such as that they need a larger wing span to soar in weaker thermals, or that they are heavier in order to slope-soar in stronger winds. But, according to Williamson, they are larger simply to keep warm, in accordance with the square-cube law.

Dr. R. C. Rainey, formerly of Imperial College Gliding Club, has just been telling us that locust swarms fly down-wind because, in the sub-tropics, winds blow towards regions of "convergence" where the resulting upcurrents produce cumulonimbus clouds and therefore provide rain for the next generation's food to grow in. He suggests that the first birds evolved in arid regions and learned to migrate for similar reasons.

The Soviet A-9 sailplane in which several World's records have been flown.

THE WING POSITION MAY CHANGE

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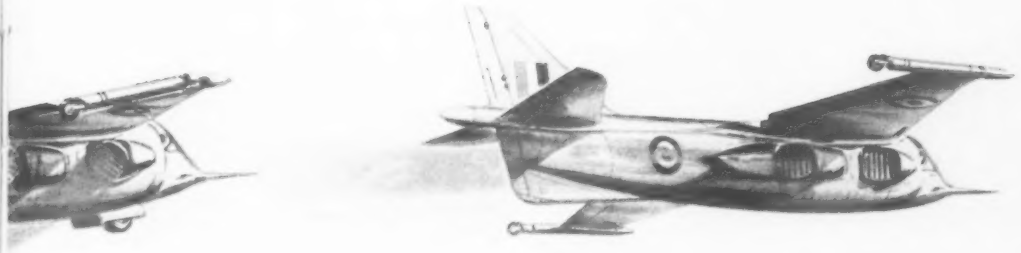


. . . AND BRISTOL SIDDELEY SUPPLY THE POWER

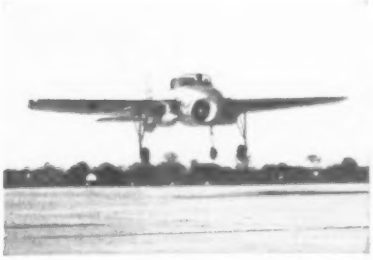
The Hawker P 1127 strike aircraft has made its first transitions—from vertical take-off to forward flight and from forward flight to vertical land. The world's first jet-sustained VTOL (vertical take-off and land) aircraft to be designed for operational service, the P 1127 obtains both lift and thrust from the same engine. The engine that has made this historic advance possible is the Bristol Siddeley Pegasus turbofan.

These successful transitions—coming so early in the P 1127 flight test programme—are an eloquent testimony to the rightness of the Bristol Siddeley VTOL philosophy; which asserts that the total installed thrust of an aircraft's *main* powerplant must be available for vertical take-off and landing, hovering, as well as for forward flight.

A unique feature of the Bristol Siddeley Pegasus is the use of four controllable jet nozzles which can be directed downwards for lift, backwards for thrust, or in any other direction required. This feature makes possible the design of single or multi-engined subsonic or supersonic aircraft in which the total installed thrust is available for vertical take-off and for transition between vertical and horizontal flight.

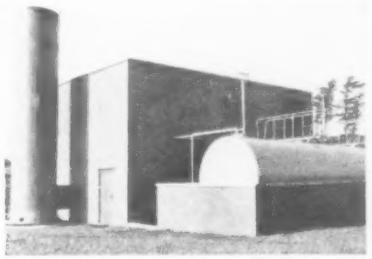
Where ground conditions permit, a Pegasus-engined aircraft can equally well make a short take-off in order to carry a heavier load or a conventional take-off if a large overload is required.

The Bristol Siddeley Pegasus is supported by the Mutual Weapons Development Programme for NATO.



POWER FOR THIS

The Bristol Siddeley Viper turbojet powered the Bell X 14 research aircraft. The X 14 was the world's first jet-sustained VTOL aircraft to achieve transition from vertical to horizontal flight. The Viper family of engines ranges from 1,600 to 3,000-lb thrust and powers many different aircraft.



. . . AND THIS

The Bristol Siddeley Industrial Proteus gas turbine engine powers a 3,000-kW turbo-generator. Designed for peak-lopping and emergency stand-by generation, this new pocket power station, two of which are already in service, delivers full power within 2 minutes of a cold start for a low capital outlay.

. . . AND THIS

The Bristol Siddeley Orpheus medium-thrust turbojet powers the NATO standard lightweight strike fighter—the Fiat G 91. The Orpheus has been selected for 5 different aircraft types which are in production for the air forces of Britain, India, Germany, Japan, Italy, Finland, Greece and Turkey.

BRISTOL SIDDELEY ENGINES LIMITED CENTRAL OFFICE: MERCURY HOUSE, 195 KNIGHTSBRIDGE, LONDON SW7

AERO-ENGINE DIVISION: PO BOX 3, FILTON, BRISTOL, ENGLAND. POWER DIVISION: PO BOX 17, COVENTRY, ENGLAND.

Commercial Aviation Affairs

B.E.A. ARGOSY.—The first of three Argosies for B.E.A., G-APRN, resumed its flight trials on Sept. 21 after modifications to B.E.A. specification standard. The changes comprise a revised instrument layout, special radio, metal lining of the freight hold, special cargo lashing points and provision for Rolamat.

T.W.A. CARAVELLE.—The first Caravelle XA, of the type ordered by T.W.A., is number 63 on the production line and is now being assembled at Toulouse. It is one of five General Electric-engined Caravelles laid down by Sud on speculation, and will be the first to have the 1-metre fuselage extension, and Douglas-built power plants. The first flight is scheduled for May, 1962.

MORE FRIENDSHIPS.—The order for five Fokker Friendship Series 200s (with an option on two more) for Nigeria Airways has now been confirmed. They will be 40 seaters and are to be delivered in December, 1962, and January, 1963. They will replace the seven DC-3s at present used, and will also permit a considerable expansion of Nigeria Airways' services. With the order from Luxembourg Airlines (see page 423) 111 Friendships have now been ordered or delivered from the Fokker factory.

IRAQ SEEKS JETS.—Iraqi Airways is adopting the unusual procedure of inviting tenders from manufacturers for the supply of an unspecified number of jet transports. Specifications will be available in due course from Iraqi embassies in Europe and the U.S. and the tender will close early in 1962. The jets are required for a Baghdad-London service and for proposed routes to Tunisia, Morocco, Copenhagen, the U.S.A., Sydney, Tokyo and China.

OFF-PEAK OCTOBER.—B.E.A. is maintaining its off-peak summer fares to and from the Continent during October. As the Corporation's reduced winter schedules do not come into force until Nov. 1 there will be a large number of available off-peak services.

EUROPEAN TRAFFIC.—Provisional Air Research Bureau figures for August, 1961, show an increase of 13% on August, 1960, in passenger-miles flown on intra-European services by its 12 member airlines. The passenger load factor was 59%. Revised figures for July (see last week's issue, p. 411) show an increase of 13% in passenger miles for the same month of 1960; the passenger load factor was 58.3%.

AIR FRANCE CHECK-INS.—From Nov. 1, Air France will follow recommended IATA practice for latest check-in times. These times, shown on the passenger tickets, will be absolute dead-lines, after which the flights will be closed. In general, latest check-in times will be 35 minutes before aircraft departure at London, Manchester and Orly.

U.S. CARGO CENTRE.—Riddle Airlines has leased two hangars (one capable of housing a DC-8 or 707) and an office building at Miami International Airport and plans to establish there "the most modern, largest and most completely automated air freight terminal in the United States."

PISTON REVIVAL?—A feature of the K.L.M. winter timetables is the relatively high frequency of DC-7C services on the Atlantic routes. Of the Montreal services (eight a week) five will be with DC-7Cs and three with DC-8s; the DC-7C will be used for one of the three daily services to New York. All winter services to the Far East will be flown with DC-8s, and flights into Malaya and Ceylon will be temporarily discontinued because Kuala Lumpur and Colombo are unsuitable for the turbojets.

AIR CEYLON.—Operation of an extended regional service using Electras, Comets or DC-6s is recommended by a team from K.L.M. which was invited to investigate the future of Air Ceylon. Services should be flown to Madras, Bombay, Karachi, Singapore, Rangoon and Bangkok. Meanwhile, talks between Air Ceylon and Air India are continuing "hopefully," according to Ceylon's Minister of Transport.

VOICE RECORDED.—Development of a cockpit voice recorder for the F.A.A. has been started by United Data Control. To be ready for tests next February, it will preserve the last 30 minutes of cockpit conversation (both internal, and air/ground). After 30 minutes the tape is automatically erased.

M.E.A. TROOPING.—Middle East Airlines has been awarded a contract to fly more than 3,000 troops of the U.N. on rotation between Scandinavia and Al-Arish in October and November.

MORE AIR LAW.—A supplement to the Warsaw Convention relating to chartered aircraft (see our issue for Sept. 21, p. 395) has now been approved by ICAO, and will become law as soon as it has been ratified by five member states of the U.N. It is open for all U.N. countries to accept this convention, which is concerned with the liability of persons other than the "contracting carrier." Drafted by the ICAO Legal Committee, it is known as the Guadalajara Convention, from the town in Mexico where it obtained full ICAO approval.

DOPPLER FOR LUFTHANSA.—Following a 12-month evaluation of various systems, Lufthansa is to equip its entire turbojet fleet (five 707-430s, eight 720Bs and 12 727s) with the Collins DN-101/NC-103 Doppler navigation system.

LANDING INCIDENTS.—A Boeing 707 of American Airlines overshot the runway when landing at Logan International Airport, Boston, in foggy weather on Sept. 24. It ended up in mudflats bordering Winthrop Bay. None of the 71 passengers and crew was injured. Equally fortunate were the 64 passengers and crew on a Starways flight from Lourdes when their DC-4 overran the runway at Dublin on Sept. 19. The aircraft in both incidents were extensively damaged.

ELECTRA QUERY.—The last transmission from the Northwest Electra which crashed immediately after take-off from Chicago O'Hare Airport on Sept. 17 was "no control. . . ." According to some reports, the remainder of the message was drowned by a transmission from another aircraft.

TURKISH ACCIDENT.—A Turkish Airlines F-27 struck a hill shortly before it was due to land at Ankara on a flight from Nicosia on Sept. 23. Preliminary reports indicate that all but one of the 25 passengers and crew of four were killed. Total passenger fatalities on scheduled airlines this year are now approximately 722.

News About People

WESTLAND CHANGES.—Mr. J. Speechley has been appointed chief development engineer of Westland Aircraft, Ltd., at Yeovil. His former post as chief of group project analysis has been taken over by Mr. D. M. Davies.

BIATA CHANGE.—Mr. H. R. Cleaver has been appointed secretary of BIATA with effect from Oct. 1 in succession to Mr. A. M. Blakemore, who is joining B.U.A. Mr. Cleaver served with the Foreign Office from 1947 to 1951, and in the Cameroons Development Corporation from 1952 to 1961.

MEET THE TEST PILOTS.—The London Society of Air Britain's sixth annual test pilots' forum is to be held in the lecture theatre of the new Holborn Central Library, 38 Theobalds Road, London, W.C.1, on Wednesday, Oct. 4, from 19.00 to 21.30 hr. In the chair will be the London Society's new chairman, Mr. S. B. Oliver, chief test pilot of Hunting Aircraft.

C.S.I.R. CHAIRMAN.—Sir Harold Roxbee Cox is to be chairman of the Council for Scientific and Industrial Research for the next five years. He takes up this appointment, in which he succeeds Sir Harry Jephcott, on Oct. 1.

ON THE MICROCELL BOARD.—Two new appointments announced by Microcell are those of Mr. F. T. Jones as a director and Mr. J. A. Grace as commercial director. Mr. Jones was for 15 years with Boulton Paul Aircraft and more recently has been production manager of Hunting Aircraft. Mr. Grace has been with de Havilland Aircraft since 1935 apart from a two-year spell with Folland in 1955-57.

B.S. SECRETARY.—Formerly company secretary of Hawker Siddeley Aviation, Mr. D. E. Hayes, is to take up a similar position with Bristol Siddeley Engines on Oct. 1. He succeeds Mr. F. Shutt, secretary since 1959, who has become financial comptroller of Hawker Siddeley Industries.

MR. C. M. VIGNOLES.—We regret to record the death on Sept. 23 of Mr. C. M. Vignoles, C.B.E. Until June of this year, when he retired, he was managing director of Shell-Mex and B.P., Ltd.

Correspondence

The Battle of the Aids

METHINKS Capt. Edward completely begs the point. (THE AEROPLANE AND ASTRONAUTICS, Sept. 14).

One does not compare the relative performances of an H.P. Herald and a Viking—but of a Herald and, say, an Avro 748. Therefore to say NDBs should be replaced by VORs is entirely irrelevant and, of course, VOR is better; but is it better than Decca or another modern aid? VOR has the possible errors stated in the article. Decca has not.

Capt. Edward's "worry circuits" should not have to operate when approaching Prestwick via Skipness to see whether he can home on an NDB. Nor should his "circuit" worry whether he is five, six or seven degrees off his desired radial on VOR. He should know where he is accurately at any given time. He can do this on Decca.

I suggest that Capt. Edward spares some time worrying about American big business that can force an inferior aid on a reluctant world.

Three Bridges. G. ABRAHAMS.

Something Wrong Somewhere

THE onlooker, they say, sees most of the game. Now I have been looking at the air transport game, and trying to see the whole thing at once—and I am baffled.

Mind you, this business of air transport economics is a pretty baffling affair anyway. Pence per passenger-seat-mile, load factors, amortization rates, cabotage, fifth freedoms and what have you, add up to a set of algebraic simultaneous equations with so many unknowns (and unknowables) that it's not at all surprising when the experts disagree. It seems quite plain that a major airline's balance sheet demands a certain amount of astute figure-juggling if a profit is to be shown; in fact, the sort and size of profit the airline makes (if it makes one at all) seems to depend largely upon the specialist who is employed to explain things to the public, or upon what case he has been told to make out.

All of which implies that airline economics are: (a) difficult; (b) somewhat wacky; and (c) sometimes not far removed from a high-class confidence trick.

And just look at what is happening now.

You cannot get into an aeroplane going from Manchester to London (without about 10 days' notice) for love or money; but just you try to start up in competition with the available airline—and the best of luck to you. On the other hand, the Big Boys soaring across the Atlantic in high-speed jet monsters are beating their brains out to discover how to get enough passengers to justify their services. But, heaven help us, all sorts of people are screaming for permission to operate over the very same routes, so that they can join in the scrabble for the passengers that there aren't enough of anyway. Sorting that one out would give all the operators, present and would-be, quite enough to think about—or so one might imagine. But oh dear no; the air transport world is cooking up a much bigger, much better and infinitely more expensive and sensational headache.

Work it out. If you don't want to go bankrupt too quickly, you must keep your million-pound aircraft in the air. It has got to earn money, and it does that by flying to and fro with fare-paying passengers aboard. And if it doesn't carry enough passengers on each flight, it doesn't make you any money.

Now the faster and bigger an aircraft is, the more passengers it can carry in a given time. The more passengers it carries per trip, the lower the fares you can charge and still make a profit (or acceptable loss). And the lower the fares, they say, the more traffic you will attract: and this is quite true, *up to a point*.

There comes a stage, however, at which you wouldn't carry any more passengers even if they travelled practically free, simply because there just aren't enough people who want to go from that particular A to that particular B, however little it costs them.

All right then. Having reached the point at which we can't even fill our long-haul aircraft at present fares or, probably, at any internationally agreed fares that would keep us in business—let alone fill the aircraft that new would-be operators want to put on the same routes—what do we do?

We set about planning to put supersonic airliners into service. Not just more aircraft rather like the present breed, but supersonic aircraft that must never remain idle for a second longer than necessary; aircraft whose productivity, in terms of potential passengers, is enormously greater than anything flying today; aircraft whose initial and development costs are astronomical even by current standards; aircraft so productive that a handful of them could carry all the predictable transatlantic traffic (how on earth could any manufacturer hope to break even, when he can sell so few?).

And now, when the World's airlines are still wondering how to pay for their last lot of aeroplanes, and how to make any sort of real profit out of present operations even if no new boys come into the game—*now* we are thinking of going in for supersonics.

We must be stone bonkers.

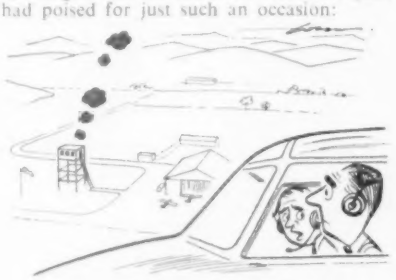
London, W.1. "Q."

Wroundabout

Heap Big Talk. With the S.B.A.C. Display over, the R.Ae.S. Anglo-American Conference was in our midst—great value in all directions, including the sociable one. Good humour is an essential part of sociability so here's a pictorial presentation of a joke sociably told by Dr. Guyford Stever, president of the Institute of the Aerospace Sciences, at the Conference dinner:

*

And that gives me the chance to work off a joke idea I've had poised for just such an occasion:



*

Battle of Biggin. At Biggin Hill on Battle of Britain Day I found it slightly ageing to take young Wren on an explanatory tour of the splendidly kept collection of five German and one Italian war-time aircraft, all at least six years older than he is. But no explaining was required for the lovely sound and sight of the Spitfire-Hurricane "Dog-fight" (vintage term!), Jeffrey Quill and Bill Bedford up. The modern men and machinery can match them, though. The "Tiger" Lightnings were smooth and easy—and kept close to the airfield unlike the Skyblazers' F-100s which vanish between passes. And the "Tiger" Turbulents were little jewels of sparkling colour and dainty movement. Aeroplanes are here to stay.

*

Outside Looking In. A Lebanese paper credits Mr. Patel, general manager of Air India International, with this remarkable statement about supersonic airliners: "The ship may be smaller than the 707 and the DC-8 and so the odds are that the Economy passenger will have to be satisfied with the exterior of the plane." I just can't think what he *really* said—or meant. Perhaps there's some sort of vague connection with an unnamed country's air regulation which IATA have come across. It goes "No person shall enter or attempt to enter any aircraft in flight."

*

"When I saw how things were shaping I got out of the business."

"Oh, yes? How much?"

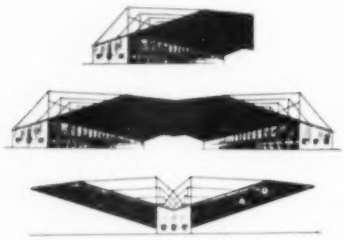
by Wren

Industry Record

Accommodation for Aircraft

Suspended cantilever hangars by the Erwin-Newman Co. of Houston, Texas, already well established for civil and military use in the U.S.A., are now available in this country through the Anglo-American Hangar Co. This company has obtained a British patent for the manufacture of these units and is the concessionnaire for the U.K. and a number of other countries.

Versatility is the main claim for the Erwin-Newman type of cantilever which has a



Top to bottom, single, facing and double cantilevers.

reach ranging from 120 to 200 ft. It lends itself readily to modification and enlargement after construction, allowing operators to increase existing hangar space in keeping with the expansion of their fleet. Length of the hangar is easily extended; the use of opposing or facing cantilever spans doubles the floor area; and double cantilevers increase floor area and provide greater height from the floor to the hangar canopy.

The canopy itself is a cantilever structure extending from the rear office and storage section, no supporting columns being necessary at the front or sides. This arrangement permits doors along the entire front span and two sides, thus allowing these three sides of the hangar to be opened for aircraft movement.

A New Ground Starter

A new aircraft starting unit from I.V. Pressure Controllers, Ltd., the Jetstart Mk. V, is designed as a source of high-pressure air reduced and controlled to fine limits. It is capable of starting four turbine engines, supplying each with the required 80 lb. of air at 60°F., 45 p.s.i.g. for 25 sec.

An initial pressure of 3,600 p.s.i. controlled down to a final 300 p.s.i. is available when in operation. The high-pressure air is contained in 24 Chesterfield bottles whose capacity totals 21 cu. ft.; they have a working pressure of 3,600 p.s.i. and are tested to 6,000 p.s.i. Minimum permissible pressure in the bottles is 300 p.s.i. Condensate can be drained from them through a valve at the rear of the unit; this can be done under pressure.

A maximum 3,600 p.s.i. is available from the high-pressure panel and a regulator-controlled 5-750 p.s.i. from the low-pressure source. Air entering and leaving the unit is filtered to 25 microns. Should a sudden air surge cause internal pressure to rise above the preset maximum a spring controlled poppet-type valve with settings variable from 1,300 to 4,000 p.s.i. operates as a relief.

Spring-loaded relief valves of a similar type are also fitted to the air bottles.

Leading particulars of the Jetstart are: length 8 ft. 5 in.; height 5 ft.; weight, when fully charged, 2¼ tons.

Above, the Pullin ASDIC equipment for the Whirlwind and Wessex.

Left, the Jetstart Mk. V, I.V. Pressure Controllers' new aircraft starting unit.

Submarine Detection Gear

Airborne dipping ASDIC equipment for the Royal Navy's Whirlwind and Wessex anti-submarine helicopters is currently in production by R. B. Pullin and Co., Ltd., under licence from Texas Instruments Inc. The equipment consists essentially of an electro-acoustic transducer which is remotely raised or lowered by a cable hoist and rotated from a control position in the helicopter.

From the transducer ultrasonic signal pulses are sent from a transmitter/receiver unit and between these pulses it receives the reflected or echo signals returned from the submerged object. The signals are amplified in the transmitter/receiver and fed to presentation circuits giving visual and aural target data.

The transducer itself is housed in a protecting dome which also contains a flux valve compass forming part of a remote positioning system. This allows the transducer to be directed and maintained at a fixed compass bearing selected on the helicopter's azimuth indicator.

Also the transducer can be automatically rotated step by step between signal pulses to permit a rapid and systematic search over a wide area.

Car Loader Choice

Channel Air Bridge, who are to introduce the Aviation Traders Carvair on car ferry services next spring, have decided on the Car-go hydraulic loading elevator for use with this aircraft. This device is manufactured by The Little Green Engineering Co., Ltd., and is a smaller version of a heavy duty aircraft loader already produced by that company.

The Car-go can also be used for general freight handling and for this purpose the lifting platform itself has been fitted with a roller-pallet floor in conjunction with Armstrong Whitworth Equipment. Power for the hydraulics is from a 9-h.p. electric motor which in turn receives its driving force from an Exide Ironclad traction battery.

The incorporation of automatic levelling equipment ensures that the platform follows the movement of the aircraft when it "settles" on its undercarriage during loading.

Lifting capacity of the Car-go is 2½ tons. Dimensions of the loading platform—which can be raised to a maximum height of 11 ft. 6 in.—are: length, 18 ft. and width, 7 ft. The complete unit can be collapsed for transportation by air.

Compatibility trials with the Car-go loading elevator and the Carvair were conducted at Southend Airport.

The 3½-litre liquid oxygen breathing system of a Buccaneer is replenished from a British Oxygen 75-litre vacuum-insulated dispenser. In the operator's gloved hands is the company's new hose coupling which incorporates a gas bleed to prevent freezing within the mechanism. This was described on p. 380 of our Sept. 14 issue.

Avdel Expansion

A greatly increased home and overseas demand for the range of high-speed fasteners produced by Avdel, Ltd., has led to the company re-housing its plant and offices in a fine new home in Welwyn Garden City. This was finally opened on Sept. 20 by Mrs. Stanley T. Johnson, wife of the company's founder and original managing director. Among the Avdel products are the well-known Jo-Bolt high-strength blind fasteners; the Chobert rapid riveting system; the Avdel self-sealing blind riveting system; and the Huckbolt fastener, made under licence.

The entire production of the company's wares can now be accommodated under one roof—and there is room for further expansion at a later date should the need arise. The new factory is a spacious single-storey building planned on contemporary lines and fully provided with the latest equipment. A total of 76,000 sq. ft. of floor space is available as production area. The two-storey office block has 16,000 sq. ft. of floor space.

Avdel—known until May of this year, when the name was changed, as Aviation Developments, Ltd.—was founded in 1936 with Sir Alliott Verdon Roe as its first chairman. Although initially concerned with the supply of fasteners to the aircraft industry, the demand has grown over the years and now extends well beyond aviation into other industries; it was this that primarily determined the change of name. Avdel products are exported in large quantities and the company recently exhibited at the Moscow Trade Fair.

New Tyres

Aircraft tyres of the size originally designed for the Lancaster, subsequently used on the Halifax and Lincoln and still in use with the Shackleton, are being produced by the Firestone Tyre and Rubber Co. to a new specification and with an advanced tread design. These are of the 64 × 22.5—26 size and are thought to be the largest now in use with any British aircraft.

The new Firestone edition has a high-tensile nylon carcass instead of one of rayon resulting in a considerable weight saving; dimensions are 5 ft. 6 in. dia. and 2 ft. in cross section width, with an 18 ply rating carcass. It has a specially designed high-speed tread and at its operational pressure, 70 p.s.i., is able to support a static load of 17 tons. It is capable of taking an impact load of 50 tons.

An M.o.A. order for a large quantity of these tyres was recently placed with Firestone. The company are justly proud of their achievement that only six months elapsed from the time its design was initiated until the first tyre left the cure.

Honeycomb Developments

In his article "Paper, Plastics and Weight-saving," published in THE AEROPLANE for Nov. 1 and Nov. 8, 1957, Mr. George May, of Dufaylite Developments, Ltd., described the shock absorbing characteristics of structural honeycombs made from paper. He tells us that since then exhaustive practical tests have been made by the Army Air Transport Development Centre with a selected grade of Dufaylite, a product of Dufaylite Developments, Ltd., as an energy dissipating material for aerial deliveries.

This selection was influenced by the need for a shock absorbing material capable of being stored and transported in a compressed state. Dufaylite was found to be ideally suited to this purpose. The paper is expanded in honeycomb form to 20 times its original bulk and then laminated into shock pads in the field by facing the core with paper skins.

This system, designed to lower the cost of delivering stores and equipment by parachute, was shown publicly for the first time at the S.B.A.C. Show where it appeared in connection with the exhibit staged by the Parachute Regiment.

Some idea of the size of Firestone's new tyre, referred to alongside, can be gained from this photograph.

Joining the Plessey Group

A further acquisition by The Plessey Co., Ltd.—the second in recent weeks—is the SPE Co., Ltd., whose entire share capital has been taken over. SPE was a subsidiary of the Pulsometer Engineering Co., Ltd., recently acquired by the Booker Group in conjunction with G. and J. Weir Holdings, Ltd., and is a manufacturer of aircraft fuel pumps and associated equipment. These are said to be complementary to the wide range of fuel pumps that Plessey's aircraft mechanical division has been producing for many years.

According to Plessey, SPE is to continue to operate as an autonomous company within the group.

Yearbook from Teddington

September has once again seen the publication by Teddington Aircraft Controls of its impressive Yearbook. This 1961-62 volume follows the pattern of its predecessors in setting out in detail a concise and up-to-date collection of technical data relating to the equipment which the company has designed and manufactured. In the Foreword it is, however, pointed out that as Teddington Aircraft's range of equipment is designed and developed against a specific requirement, it is possible to detail only a representative part of the full range it produces.

Aviation Calendar

Sept. 28

London.—Science Museum lecture, "Astronomy including the Star Dome," at the Science Museum, Exhibition Road, S.W.7, at 15.15 hrs.

Oct. 3

London Airport.—R.Ae.S. Branch lecture, "The D.H. 121," by J. P. Smith, at the B.O.A.C. Senior Mess Club, at 18.00 hrs.

Oct. 4

Bristol.—Institution of Production Engineers and R.Ae.S. joint lecture, "Rocket Propulsion of Aerodynamics and Space Vehicles," by E. G. D. Andrews, at Bristol University, at 19.30 hrs.

London.—British Institution of Radio Engineers Electro-Acoustics Group lecture, "Methods Used for the Study of Vibration in Aero Engines," by D. A. Drew, at the London School of Hygiene and Tropical Medicine, W.C.1, at 18.00 hrs.

Oct. 5

Harrogate.—Aerodrome Owners Association Conference, at the Cairn Hotel, until Oct. 6.

Oct. 10

Birmingham.—Institution of Production Engineers, Midlands Section lecture, "Manufacturing Techniques of the Armstrong Whitworth Argosy," by R. A. Courtman and A. W. Menzies, at the James Watt Memorial Institute, at 19.00 hrs.

Luton Airport.—R.Ae.S. Branch Film Evening, in the Napier Senior Staff Canteen, at 18.00 hrs.

Oct. 11

Bristol.—British Institution of Radio Engineers, South-Western Section lectures, "General Introduction to Inertial Navigation," by R. Collinson, and "Components and Techniques employed in Inertial Navigation Systems," by E. Bristowe, at the School of Management Studies, Unity Street, at 19.00 hrs.

Oct. 12

London.—Institute of Production Engineers, Section lecture, "The Hovercraft," by J. M. George, at the R.Ae.S., at 19.00 hrs.

London.—Radar and Electronics Association lecture, "Space Communications—Systems and Equipment," by L. F. Matthews, at the Royal Society of Arts, John Adam Street, W.1, at 19.00 hrs.

London.—GAPAN lecture, "Stress and Human Performance," by Air Cdre. W. K. Stewart, at the Institution of Mechanical Engineers, 1 Birdcage Walk, S.W.1, at 18.45 hrs.

New Patents

APPLICATIONS ACCEPTED

880,136.—**S. Smith and Sons (England), Ltd.**—"Aircraft indicating instruments." Feb. 24, 1960. (Mar. 3, 1959.)

880,320.—**General Precision Inc.**—"Flight simulators." Oct. 28, 1957. (Oct. 26, 1956.)

880,126.—**B. J. Varden.**—"Controllable mount for aircraft powerplant." Sept. 23, 1959. (Nov. 5, 1958.)

880,127.—**B. J. Varden.**—"Controllable mount for aircraft powerplant." Sept. 23, 1959. (Nov. 5, 1958.) (Divided out of 880,126).

880,417.—**J. J. M. J. Gerin.**—"Extensible device for aircraft wings." May 7, 1958. (May 13, 1957 and Sept. 23, 1957.)

880,425.—**Parsons Corporation.**—"Rotor blades for helicopters and the like." Oct. 16, 1958. (Oct. 21, 1957.)

880,010.—**B. J. Varden.**—"Controllable mount for aircraft powerplant," Sept. 23, 1959. (Nov. 5, 1958.) (Divided out of 880,126).

Printed specifications of the above will be available on Oct. 18, 1961, and the opposition period will expire on Jan. 18, 1962.

880,530.—**D. Napier and Son, Ltd.**—"Detecting apparatus for icing conditions." Sept. 7, 1959. (Inc. 5, 1958.)

880,829.—**Dowty-Rotol, Ltd.**—"Fluid-pressure-operated systems." Aug. 16, 1960.

880,606.—**Rolls-Royce, Ltd.**—"Aircraft." Nov. 12, 1959. (Nov. 21, 1958.)

880,825.—**Boeing Airplane Co.**—"Folding mechanism for a helicopter rotor blade." Jan. 6, 1960.

880,499.—**Irving Air Chute of Great Britain, Ltd.**—"Parachutists equipment." Apr. 21, 1960. (Apr. 22, 1959.)

880,578.—**P. D. Bolton.**—"Mechanism for locating and positioning of aircraft." Oct. 27, 1958. (Oct. 28, 1957.)

Printed specifications of the above will be available on Oct. 25, 1961, and the opposition period will expire on Jan. 25, 1962.

881,431.—**General Precision Inc.**—"Training apparatus such as ground aircraft trainers." Oct. 29, 1957. (Nov. 7, 1956.)

881,513.—**Daimler-Benz A.G.**—"Turbojet propulsion units in aircraft." Jan. 13, 1960. (Jan. 17, 1959.) (Addition to 857,899).

Printed specifications of the above will be available on Nov. 1, 1961, and the opposition period will expire on Feb. 1, 1962.

THE AEROPLANE and ASTRONAUTICS CLASSIFIED ADVERTISEMENTS

PRESS DAY: Classified Advertisements must normally be received at Head Office by FIRST POST THURSDAY for the following Thursday's issue. Last-minute additions and deletions are accepted by telephone from trade advertisers up to noon. Advertisements received too late for a particular issue are automatically inserted in the succeeding one unless instructions to the contrary are received.

RATES—1/- per word (minimum 12 words 12/-). Each paragraph charged separately and name and address must be paid for. Semi-displayed setting £3-17-6 per single column inch. Centred lines 22/6. Series discounts of 5% for 13, 10% for 26 and 15% for 52 consecutive insertions, allowed to trade advertisers.

TERMS—Strictly net and prepayable. Monthly accounts for settlement by the end of the month following insertion are allowed to trade advertisers if satisfactory references are provided.

REMITTANCES—Cheques and postal orders should be crossed and made payable to TEMPLE PRESS LIMITED and instructions sent addressed to the Manager, "The Aeroplane and Astronautics," Bowling Green Lane, London, E.C.1.

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BOX NUMBERS—Private advertisers desiring to have replies sent care of "The Aeroplane and Astronautics," may do so on payment of 1/- to cover booking and postage, plus cost of four extra words. Box Numbers must not be used for the purpose of circularizing and the Proprietors do not undertake the distribution of such matter received. To avoid mistakes in forwarding, Box Numbers should be carefully and legibly copied and replies sent to Box A000, care of "The Aeroplane and Astronautics," Bowling Green Lane, London, E.C.1.

THE PROPRIETORS retain the right to refuse or withdraw advertisements at their discretion and are not responsible for clerical or printers' errors, although every care is taken to avoid mistakes.

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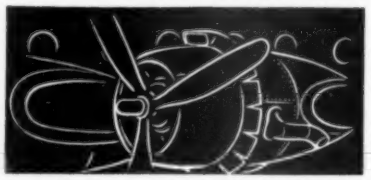

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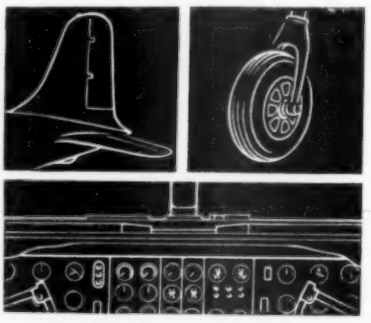

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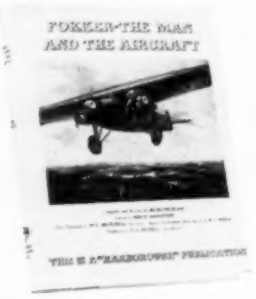

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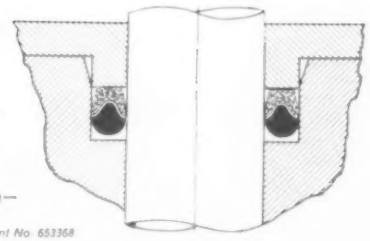

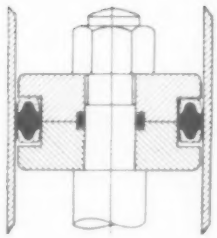

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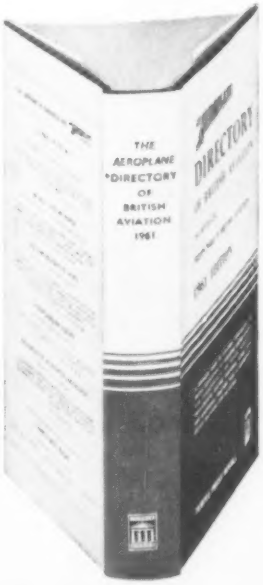

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